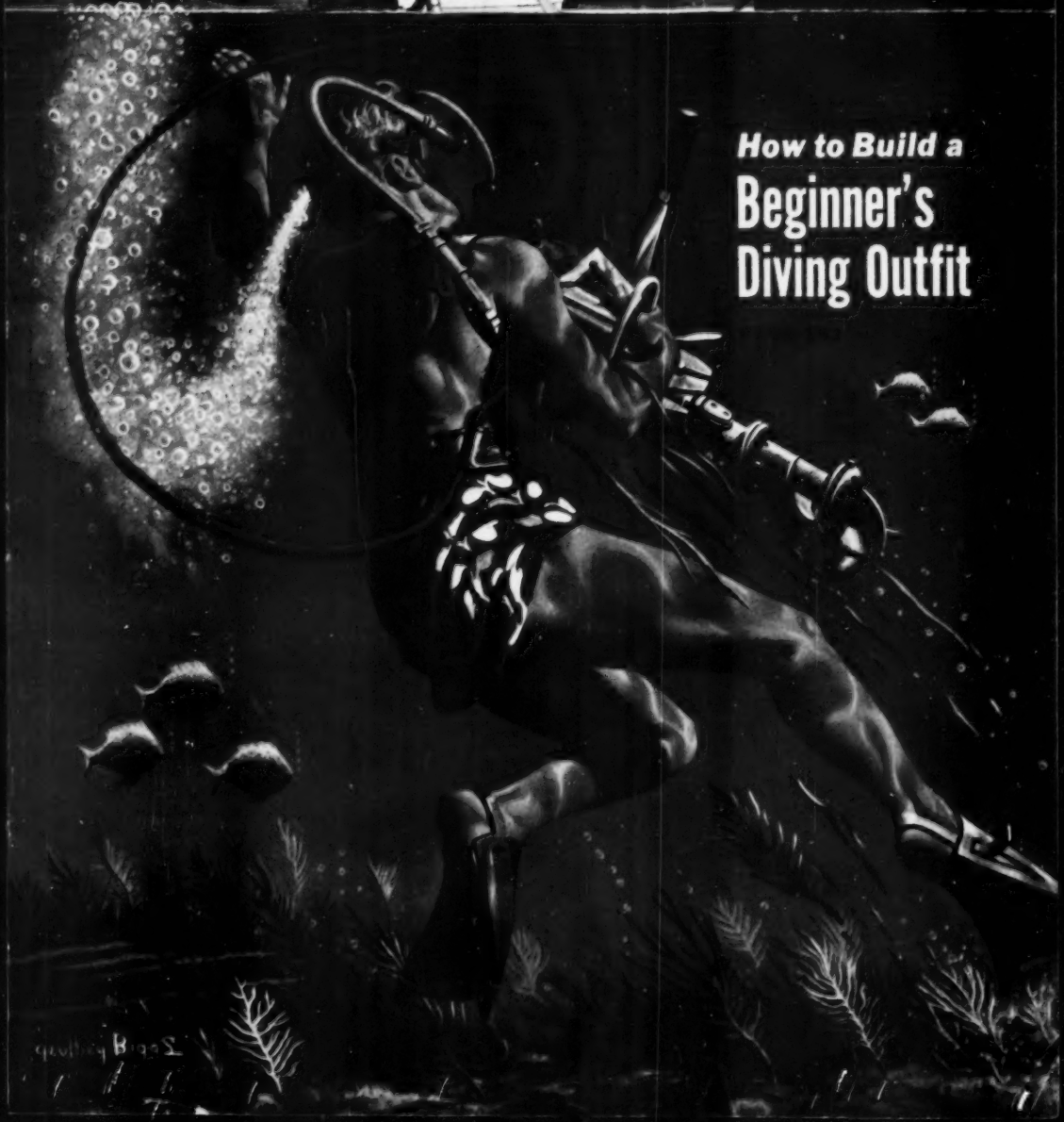
POPULAR SCIENCE

MONTHLY

MECHANICS - AUTOS - HOMEBUILDING

June 35¢



How to Build a

Beginner's Diving Outfit

NOW! GO FISHIN' WITH A

Quiet

OUTBOARD MOTOR

NEW JOHNSON SEA-HORSE 5½

- *Entirely New! Entirely Different!*
- *Suspension Drive—Quiet! No Vibration!*
- *Air Intake and Exhaust Relief Silencers!*
- *Full Gear Shift—forward, neutral, reverse!*
- *Up-and-Off Motor Hood!*
- *Mile-Master Fuel System!*
- *Twist-Grip Speed Control!*
- *Fitted for Ship-Master Remote Control!*
- *Horsepower—5½ hp!*

Never before have so many fine features been concentrated in a motor of this trim size—*the popular size that outsells all others!* Here at last are "big motor" developments with small motor handling ease. *Plus Johnson's revolutionary Suspension Drive that dissipates vibration and reduces noise!* See your Johnson Dealer. (Look for his name under "Outboard Motors" in your classified telephone book.)

The first outboard motor ever to win a citation from the National Motor Awards Council.

Another Great Fishin' Favorite!

The little motor with the big push—32-lb. TWIN, 3 hp! Amazing Angle-matic Drive takes you where others dare not venture! Slides thru weeds, skis over underwater obstructions, keeps driving in *inches* of water.

JOHNSON SEA-HORSE 3

FREE! New Sea-Horse catalog, packed with information on Johnson's latest, *and greatest*, developments. New features fully described. Complete specifications on all models. Write for your copy.

JOHNSON MOTORS, 500 Pershing Road, Waukegan, Illinois

In Canada: Manufactured by Johnson Motors, Peterborough

THE NEW 1954 SEA-HORSES

ELECTRIC STARTING SEA-HORSE 25—25 hp. The "automatic" outboard **$498.00***
SEA-HORSE 25—25 hp. Ready-Pull starting..... **$410.00***
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SEA-HORSE 3—3 hp. Rugged 32-lb. TWIN..... **$145.00**
SHIP-MASTER REMOTE CONTROL—For shift and throttle. Fits Sea-Horse 5½, 10, and both 25's. From..... **$29.50**

Prices f.o.b. factory, subject to change. OBC certified brake hp at 4000 rpm.
**Includes Mile-Master Fuel System.*

Johnson SEA-HORSES FOR DEPENDABILITY

THIS 1940 FORD HAS GONE 148,000 MILES WITHOUT OVERHAUL

. . . YET THE ENGINE IS AS POWERFUL AS NEW

Winthrop A. Johns and the original test car — says Win: "I don't expect to live long enough to wear this engine to the first overhaul! At the present rate of wear it will run at least 700,000 miles."

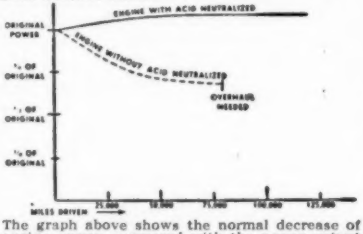
THIS CAR, AND Hundreds of Other Test Vehicles Are Revolutionizing Motor History By Means of a Special New Device that Neutralizes Corrosive Acids as They Are Formed!

HERE IS PROOF

These are FACTS gathered in 13 years of road tests over millions of miles in 1500 cars and trucks—NOT laboratory tests under simulated conditions.

1. POWER

No engine tested decreased in power. Many have gone 120,000 miles.



The graph above shows the normal decrease of engine power, compared with the power output of engines protected from acids. Top performance is yours almost indefinitely—one, two, five or even ten years. Most protected engines are outlasting their bodies.

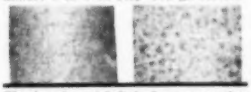
2. IGNITION

Spark plugs last up to 60,000 miles—waste less gas. The two spark plugs shown are from a set of 8 after 60,000 miles—the entire set still testing 93% efficient!

Actual photo after 61,810 miles, showing good condition of the electrodes.

3. FRICTION WEAR ALMOST DISAPPEARS

Fleet tests show wear reductions of almost 6 to 1 in stop and go service.



The bearing at left is from an engine with Magna-Power after 112,000 miles in 11 years. It is still good for many more years and 4 times the miles. At right, one from an unprotected engine after 63,000 miles; WORN OUT!

IS IT ACID OR FRICTION?

Engine friction—excepting fans, pumps, belts and windage—is negligible. Our tests show almost no metal to metal contact. Acid is the real cause of motor deterioration.

SULPHUR FORMS ACIDS

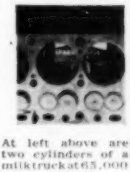
Gasoline is about 1/1000th sulphur. Leaded gasoline also contains bromine and chlorine. In 1000 gallons (enough for 15,000 to 20,000 miles) there is about 6 lbs. of sulphur—enough to make 5 gallons of strong sulphuric acid. When gasoline burns, corrosive gases (SO_2 SO_3 HBr and HCl) blow by the pistons into the crankcase. Here they combine with condensed water (also blown by) almost always present in oil, to start a vicious circle. SO_3 is a thirsty compound. It absorbs water to form sulphuric acid, which in turn attracts more water, which dissolves more SO_3, which in turn attracts more water! This water body then absorbs gases to form H_2CO_3, H_2SO_3, HCl and HBr—all corrosive acids. Acids cannot work without water—but your engine makes large amounts of it—about a gallon for each gallon of gas; you have seen it drip from your exhaust!

ENGINES HAVE SHORT LIFE

In door to door service some have an appallingly short life. Often only 15,000 to 20,000 miles! Enough materials blow into the crankcase to make a pint of acid a day. Most of these are removed by ventilation but the small amount left is enough to damage your engine seriously. Even carbonic acid, which you drink in soda pop is powerful enough to corrode iron ½ inch per year.

NEW DIRECT WAY TO KILL ACIDS

Acids destroy themselves by eating metals. Acids attack first metals most easily eaten. Almost perfect protection is obtained by a special alloy of MAGNESIUM and aluminum. Since magnesium is by far the most easily attacked metal in the engine, the acids eat it and are destroyed. Without acids, water is no longer held. Without water acids cannot form. The vicious circle is interrupted. Less sludges, gums and resins are formed.



At left above are two cylinders of a milk truck at 65,000 miles with Magna-Power. It is ¼ worn out. Identical engines in the same fleet but without Magna-Power wore out completely at 40,000 miles. At right are shown several large city buses—part of the extensive fleet testing program.

A Magna-Power acid neutralizer. Pat. Appl. for.

SUMMARIZING:

Normal wear, as you know it, does not exist. Manufacturer's figures are increased up to 10% in economy, speed, power. Engine wear life is increased to at least 500,000 miles by adding the Magna-Power Acid Neutralizer. Magna-Power will help any engine that uses less than 1 qt. of oil each 500 miles, OR YOUR MONEY BACK.

GET ONE NOW FOR YOUR NEXT OIL CHANGE—

The gasoline you buy has sulphur in it. When sulphur burns it forms sulphuric acid. Sulphuric acid eats metal. Little by little your engine is eaten away. To combat this damage, many oil companies are now using anti-acids in their oils. But what happens when these compounds are overcome? Your engine corrodes once more!

Acid is one of nature's methods of reducing refined metals to their original primitive state. Even the Shell Oil Co. has now proven that acid corrosion is the major cause of engine wear!

There Is Only One Way to Safely Inhibit Acid Formation in Your Engine

Of course, if you choose to carry testing apparatus (litmus paper or some such other device) you might be able to tell when your oil is becoming acid, due to the destruction of the anti-acid compounds. But the easiest way, it seems to us, is to use a metal plug of MAGNESIUM and aluminum, which is by nature an alkaline metal, and which, attached to your oil drain plug, permits easy inspection at the time you change your oil. Thus you can see at a glance, by means of observing the state of corrosion of the plug, whether or not your engine is being attacked. For acids much prefer alkaline metals such as magnesium for "lunch," to the other metals in the engine.

This is a Very Simple Idea

However, it was developed by a mechanical engineer after many years of trial and error, using such compounds at first as potash, magnesium shavings and other devices, none of which were as easy, simple or positive as this new oil-drain plug device.

It Is Thoroughly Tested

Milk fleets, passenger cars, bus lines and trucking companies all have tested the new "Magna-Power" Neutralizer in controlled field operations. Their enthusiastic letters are available for your inspection at any time.

You Can See the Action in a Few Seconds

If you take a Magna-Power Neutralizer and drop it into a glass of vinegar you will see it foam wildly. Even grapefruit juice will cause an effervescent action.

Experiment with the Magna-Power Neutralizer at OUR Risk

If you are not satisfied with the way it works send it back, at any time (years from now, if you choose), for an immediate refund.

Johns Manufacturing Company, Dept B-6, Dunellen, N. J.

JOHNS MFG. CO.,
Dept. B-6, Dunellen, N.J.

My car is a ..... (make)

..... year.

Please send me, postpaid, a MAGNA POWER acid neutralizer. I enclose $2.95. I understand that it is sold with an unconditional guarantee of satisfaction or my money back!

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Street .....

City ..... Zone .. State ...

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Vol. 164: No. 6

POPULAR SCIENCE
REG. U.S. PAT. OFF. *Monthly*

Mechanics and Handicraft
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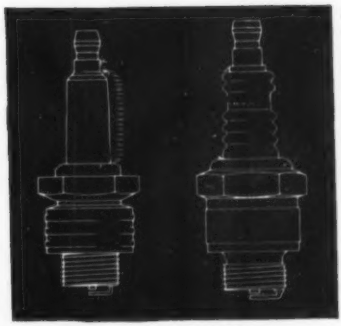
THE JAGUAR 120 C—Won 1953 LeMans—world's greatest sports car race. All Jaguars are fitted with Champions.

THE LANCIA—These new cars bearing the long-famous name and using Champions won the 1953 Mexican Road Race.

THE FERRARI—Champion-equipped 4.5 litre Ferraris have scored 1954 victories at MacDill, Hunter and Bergstrom Air Base races and in the 625-mile Argentine classic.



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Here's why Champions give you faster starting. Laboratory tests prove Champion's exclusive 5-rib insulator resists "shorting" or "flashover" up to 40% more than ordinary smooth insulator plugs because the path the electricity is forced to take is greater.

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MAKE ANY CAR RUN BETTER

Try the sensational PROTO No. 234 Multi-Purpose Plier and you will want one for sure! Using a patented three-piece compound leverage design, pressure applied to the handles is increased *ten times* at the jaws! This plier is actually "a chest of tools in one." It securely holds square, round and even tapered objects. To make your work easier, buy one today!

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In the extensive PROTO line, you will find the right size and style of plier for almost every job. And remember that every one has true *professional quality*. Send 10¢ for complete 68-page catalog to

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Man Behind the By-Line

THAT persistent AC hum heard in PSM offices isn't a defective fluorescent—it's Wesley S. Griswold, one of the magazine's most productive editors. Almost every issue will carry a major piece by him, and most will show his proficient but unsigned touch on half a dozen other articles. A general-assignment man in a crew of specialists, Wes has turned his typewriter on everything from atomic energy to Detroit iron to plastic fishing lures.

A not-so-old pro, Wes has put in 11 years as a newspaperman and almost nine as a magazine editor—five as staff man for *The New Yorker* and the remainder with PSM. His keyboard skills aren't limited to the typewriter—he also plays a real gone piano.

This month don't miss his "The Car That Has Changed the Most" (page 138).

How to look good to your boss

The old tricks of "flattery" and "bluff" no longer work—though men still try them. Here's a new technique that seems to be paying off.

WITHIN the next twelve months, someone you work with will hit the jackpot on promotion. Overnight he'll jump to a key position—and everybody will wonder why.

Chances are, he's cashing in on a new way to impress the boss—*self-improvement on the QT.*

With jobs getting tighter, employers are giving the cold eye to men who obviously are trying to make an impression without anything to back it up. The phony eager beavers, overtime hounds and front office pets are due for a rude awakening.

Sincerity, honest work and *interest beyond the job* are getting the nod. And top dog is the man who uses his *spare* time to train for advancement.

I.C.S. sees this showing up in a great new surge of interest in advanced technical and business courses.

Men who look into correspondence training are suddenly clipping coupons and enrolling. Current I.C.S. students include a good many college graduates. Also engineers seeking courses in business management. And men who need a quick brush-up or refresher course.

Says James L. Morgan of the Morgan Cotton Mills, Inc., "We keep an eye on our I.C.S. students. They may study alone at home. But the results show up in their work—and make possible promotions otherwise impossible." Mr. Morgan speaks from experience—his own I.C.S. experience.

For Real Job Security — Get I. C. S. Training! **I. C. S., Scranton 9, Penna.**

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- ☐ Stationary Steam Engineering

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- ☐ Cotton, Rayon, Woolen Mfg.
- ☐ Finishing and Dyeing
- ☐ Loom Fixing
- ☐ Textile Designing
- ☐ Textile Eng'r'g ☐ Throwing
- ☐ Warping and Weaving

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SPLITTING HAIRS

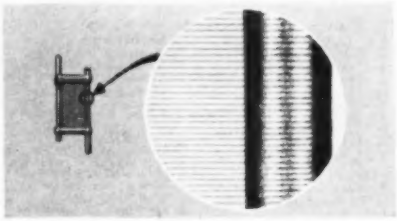
TO SPEED CALLS

This coaxial system electron tube amplifies more voices at the same time because of wider frequency band – made possible by bringing grid and cathode closer together.

To triple the voice-carrying capacity of coaxial cable, Bell Laboratories engineers had to create new amplifying tubes with the grid placed only two-thirds of a hair's breadth from the cathode. Furthermore, the grid wires had to be held rigidly in position; one-quarter of a hair's shifting would cut amplification in half.

Working with their Bell System manufacturing partners at Western Electric, the engineers developed precise optical means for measuring critical spacing insulators. On a rigid molybdenum grid frame they wound tungsten wire three ten-thousandths of an inch thick. To prevent the slightest movement they stretched the wire under more tension for its size than suspension bridge cables, then bonded it to the frame by a new process.

The resulting tube increases coaxial's capacity from 600 to 1800 simultaneous voices—another example of how Bell Telephone Laboratories research helps keep your telephone system growing at the lowest possible cost.



Actual grid is shown above on left. Enlarged picture at right shows how wires are anchored by a glass bond. They will not sag despite nearness of red-hot cathode.

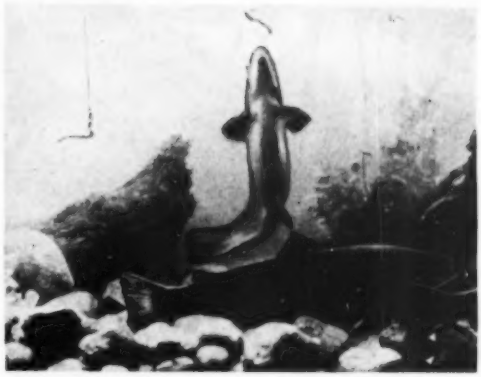
BELL TELEPHONE LABORATORIES

IMPROVING TELEPHONE SERVICE FOR AMERICA PROVIDES CAREERS FOR CREATIVE MEN IN SCIENTIFIC AND TECHNICAL FIELDS

Amazing New Way To Catch More Fish

Scientists Reveal Amazing Results of Laboratory Experiments! Fish Scents Travel Through Water, Draw Fish to Hook, *Make Them Bite!* Fishermen Report Astonishing Success!

Do you ever wonder why you come back from a fishing trip with little more than a sunburn? Does your investment in expensive equipment sometimes bring disappointing results? Well, it may not be the fault of your tackle, lure, or even bait. Your bait would probably look fine to the fish—and they would *love to bite* . . . IF THEY COULD JUST SEE IT! The truth is—most fish are extremely near-sighted . . . many are almost *blind!* Unless your fancy lure happens to land right under the nose of the fish, they might not see it and bite. You can sit for hours without a nibble, while hundreds of fish swim within a stone's throw of your hook. And if you use live bait—the chances are that a fish will not pick *your* bait in preference to all the other good things to eat that live in the same water! The big question is—Is it possible to develop a lure that will attract fish far beyond the range of vision—with an attraction that no fish can resist? Read on—the answer is in this story!



The Same Bait in the Same Spot...But Just Look!

Do fish "take" your bait like this? Do they fight each other to get hooked? Or do they leave your line alone like the hook on the left? In this aquarium test you see two hooks hanging on lines in the same spot with identical bait! The fish was caught on the hook on the right because the worm on that hook was treated with FISH-LURE, the sensational scent that draws fish by smell and taste. This low cost scent comes in tubes, specially blended to appeal to fish. Read this page. Learn how this amazing scent will increase your catch.

Read These Reports By Scientists

Some scientists decided to find out once and for all—**why fish bite!** Five healthy, hungry catfish were placed in an aquarium of water. Also into the water were suspended two **identical** wads of cheesecloth. But buried in the center of **just one** was some **minced earthworm.** The scientists watched the catfish pass by the empty wad dozens of times, never paying any attention to it. But the wad with the earthworm was **attacked eleven times** during the test period!

Now here's the $64 question. How did the fish know which pad contained the earthworm?

"Cats" and "Dogs" Team Up

The tests on the catfish seemed to prove that, although the fish saw two identical wads, some sense led them unerringly to the right one **every time!** What sense? The scientists determined to find out. The "cats" were replaced in the tank by "dogs" . . . or dogfish. When they lower a crushed crab into the water, some unseen message excites the fish. He begins to hunt in an amazing figure-8 pattern. Tighter and tighter become the loops of the figure-8 until Snap!—no more crab!

And then the final test. **Both** of the fish's nostrils are blocked. Again a crab is placed in the tank. What happens? **Nothing!** Not the slightest sign that the fish is aware of the food practically staring him in the face. Experiments like these were performed again and again with various types of fish—fresh and salt water—and the results were always the same.

The conclusion is the same obvious one. Even when the bait was not in sight, the fish tracked it down like bloodhounds. And when it **was** in sight, they still depended on their most reliable senses—SMELL and TASTE.

How Professional Fishermen Use This Knowledge of Fish Senses

Did you know that many professionals actually **add smells** to their live bait? It actually increases their catches tremendously. Why? Because untreated bait smells no stronger than all the other fish food in the water, while a very strong smell draws the fish in spite of other temptations. A leading ichthyologist reports " . . . experiments have proven that fish can locate food by the sense of smell and the fact that fishes of many species can be caught on a baited hook, on a dark night or in water so deep that light does not penetrate, certainly indicates that it is smell, not sight, that locates the food in such instances."

Years of research has resulted in the development of a single ALL-PURPOSE scent that attracts fish like magic. This scent is so powerful that one dab is all you need to insure successful results. And now this sensational scent is available to you, under the name of FISH-LURE.

Mr. R. R. W., Northport, L.I., writes:—"I had excellent success with this FISH-LURE and as a result a number of the members of the surf fishing club to which I belong wish to try it."

Fishermen Praise Fish-Lure

Thousands of fishermen have already tried this amazing fish odor. You've never seen such raves! In case after case, fishermen who had been coming back with no fish at all were able to catch quickly their limit of fish. Those big fellows that usually stayed in their deep holes and never took the bait before were drawn by FISH-LURE and hooked! Time and time again, fishermen report how this amazing scent catches full strings of fish while people fishing nearby catch only a few. Professional fishermen were amazed! Amateurs have shocked the experts, by catching big ones where everyone "knew" there weren't any fish.

Don't Throw Away Your Old Bait and Dry Lures

The makers of FISH-LURE do not claim that the type of lure you're now using won't catch fish. But we do say this. No matter what type of fish you're after—trout, bass, sunfish, perch, carp, cat etc. FISH-LURE will increase your catch—or your money back. Just use the equipment you've always used—PLUS one application of FISH-LURE. Then watch the results. See for yourself how FISH-LURE sends its tantalizing call much further than many fish can see! Compare your catches with anyone using untreated bait! You'll be convinced!

Free Trial Introductory Offer!

Now you can try FISH-LURE under a no-risk money-back guarantee. Each tube of FISH-LURE will treat hundreds of live or dry baits. Simply mail the coupon below, enclosing only $2.00, and your tube of FISH-LURE will be sent to you at once, postpaid. Try FISH-LURE on your next fishing trip. Remember—you must catch fish—more fish than you catch without FISH-LURE—more fish than your friends catch with untreated bait—or your money back. Mail the coupon now!

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I enclose 2.00 each for ..... tubes of FISH-LURE. I understand that this special scent must draw fish to my hook and increase my catch or it will cost me nothing. If I am not delighted with the results, you will refund my money, no questions asked.

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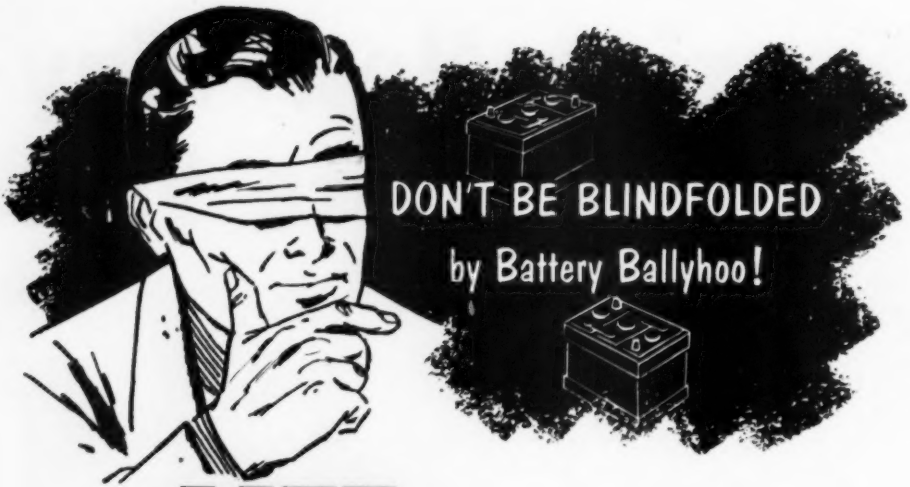

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These words—spoken in 1946 by David Sarnoff, Chairman of the Board of RCA—have a ring of triumph today.

The day on which the FCC approved standards for the commercial broadcasting of *compatible color television*—December 17, 1953—will be remembered in the annals of communications along with the historic date of April 30, 1939, when RCA-NBC introduced *black-and-white television.*

At that time sight was added to sound. Now color has been added to sight.

RCA scientists were engaged in research basically related to *color* television as far back as the 1920's . . . even before *black-and-white* television service was introduced.

Since then RCA has spent over $25,000,000 to add the reality of color to black-and-white TV, including development of the tri-color tube.

The fruit of this great investment is the RCA all-electronic compatible color television system. *a system that provides for the telecasting of high-quality color pictures that can be received in full color on color receivers; and in black and white on the set you now own.*

Although it will probably be another year before mass production is reached, the promise of compatible color TV is being fulfilled.

RCA pioneered and developed compatible color television

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"Up to our necks in Radio-Television work. Four other NRI men work here. Am happy with my work."—Glen Peterson, Bradford, Ont., Canada.

"Am doing Radio and Television Servicing full time. Now have my own shop. I owe my success to N.R.I."—Curtis Stath, Ft. Madison, Iowa.

"Am with WCOC. NRI course can't be beat. No trouble passing 1st class Radio-phone license exam."—Jesse W. Parker, Meridian, Mississippi.

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You benefit by my 40 years' experience training men at home. Well illustrated lessons give you basic principles you need. Skillfully developed kits of parts I send (see below) "bring to life" things you learn from lessons.

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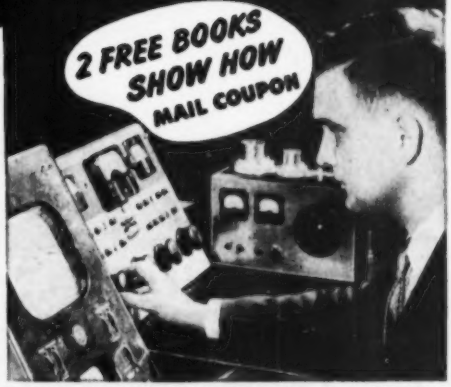

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Letters

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NED H. DEARBORN, PRESIDENT
National Safety Council

Thank you, Mr. Dearborn. We are proud of having won this award for the third consecutive year.

How to Make a Garden Spurt

I put a hot-water pipe beside the cold-water pipe which runs to the outside of my house, for use in the garden. Now, each spring, in place of watering the seeds with

cold water, I use warm, and our garden is regularly two weeks ahead of the neighbors'.

F. W. BEEKER, Whitehorse, YT, Can.

Short History of Selden's Car

Actually, the oldest car painted by C. P. Hornung [March, p. 107] is the 1895 Duryea. The 1877 Selden was really not built until after 1900.

In 1876, George Selden saw an internal-combustion engine built by George Brayton. Selden later built an engine of the same

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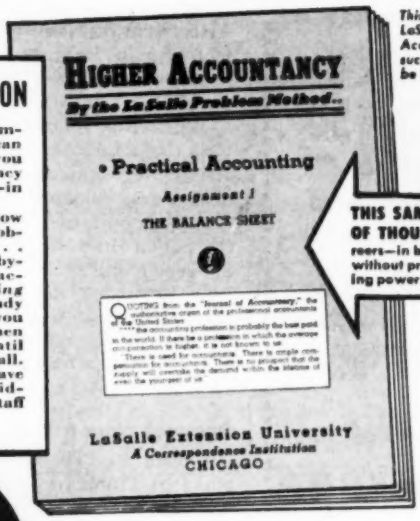

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type. In 1879, he filed with the Patent Office the drawings of the vehicle known as the 1877 Selden. By making modifications, Selden kept the patent pending until 1895, when it was approved. He then made an agreement whereby the Electric Vehicle Company controlled the patent in return for a royalty to be paid to Selden. The big stockholders of the company formed the Association of Licensed Automobile Manufacturers in 1903 to license other manufacturers in return for a royalty on each car made.

When Henry Ford refused to pay royalties, the ALAM started legal proceedings against his company. To show that Selden's design was practical, the Electric Vehicle Company built two vehicles patterned after the patent drawings and powered by Brayton-type engines.

In 1911, the U. S. Appellate Court ruled that the patent was valid only when the Brayton engine was used. The ALAM dissolved shortly afterward.

TERRY GRANT, Belton, Tex.

Bouquet from a Woman Reader

I want to take the opportunity to tell you that POPULAR SCIENCE MONTHLY is a must in our budget. You designate it as a man's magazine, but I must say that I find a

wealth of useful material for me in it that can't be found in the so-called "women's magazines."

MRS. LEONARD W. CALVERT,
Ottawa Lake, Mich.

They Already Make It

A contributor to your "I'd like to See Them Make" feature in February [p. 177] suggested "a safety razor with a magnet built into the end of the handle so dropped blades could be picked up easily and safely." I beg to draw your attention and his to the fact that such a safety razor has been made

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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C. G. Catchatoor, Calcutta, India

Novel Trap for Speeders

How about an electric-eye detectograph for catching speeders? I visualize it as an electric-eye device that would control the shutter of a camera, set at an angle beside the highway so that it could get a good view of passing license plates. This apparatus would be synchronized with mechanisms registering speed, time and date. Perhaps it should also have an infrared device for night photography.

Then the law-enforcement officers could make the rounds of the cameras every 24 hours, picking up the previous day's film and

sending out summonses on the basis of its evidence. The system might also help catch criminals at large on the highways.

Caspar H. Smith, Tacoma, Wash.

Let the Sun Boil Alcohol!

In "Sun Furnace Goes to Work" [March, p. 129], you stated that if heat engines could run efficiently at lower temperatures than conventional types, one might be able to utilize solar power. Why not use a liquid of a lower boiling point, such as alcohol? With a closed circulating system, it should not prove too expensive.

Alan C. Davidson, Brooklyn, N. Y.

Seems like an idea worth trying.

Gus Gets His Wires Crossed

Oh, no! You done him wrong.

On page 260 of your April issue, Gus skins the insulation off a wire to wind an electromagnet.

The Gus I have so long read about with

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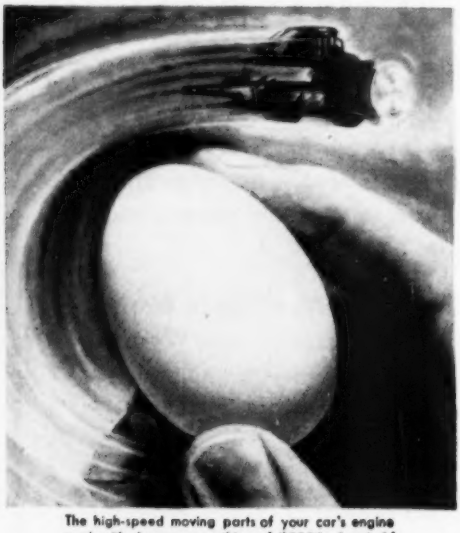

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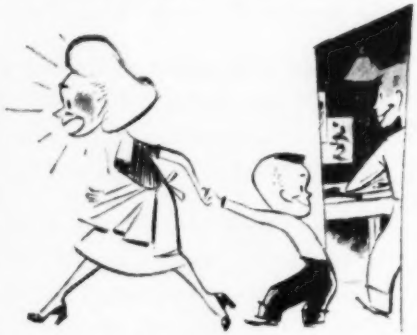
Give us more Gus Wilson stories but I wish you'd check a little closer with the "book mechanic."

LEROY R. SHEARER, Los Angeles, Calif.

How He Killed Curiosity

Being able to work alone in my hobby shop was a problem, because the kids and my wife were always bothering me. So I bought some snappy pictures and hung them all over the walls of the shop. Now the wife refuses to come near the shop and



keeps the kids away from it, too. At last I have complete satisfaction.

JAMES J. KAYS, Modesto, Calif.

The Radiated-Power Race

In your article "Man's Tallest Tower to Broadcast TV" [Feb., p. 166], you stated that the station [Oklahoma City's 316,000-watt KWTV] would be 50,000 watts stronger than any other. I would like to inform "yawl" that WABT in Birmingham, Ala., has been operating on 316,000 watts for many months.

LLOYD M. MOORE, Hartselle, Ala.

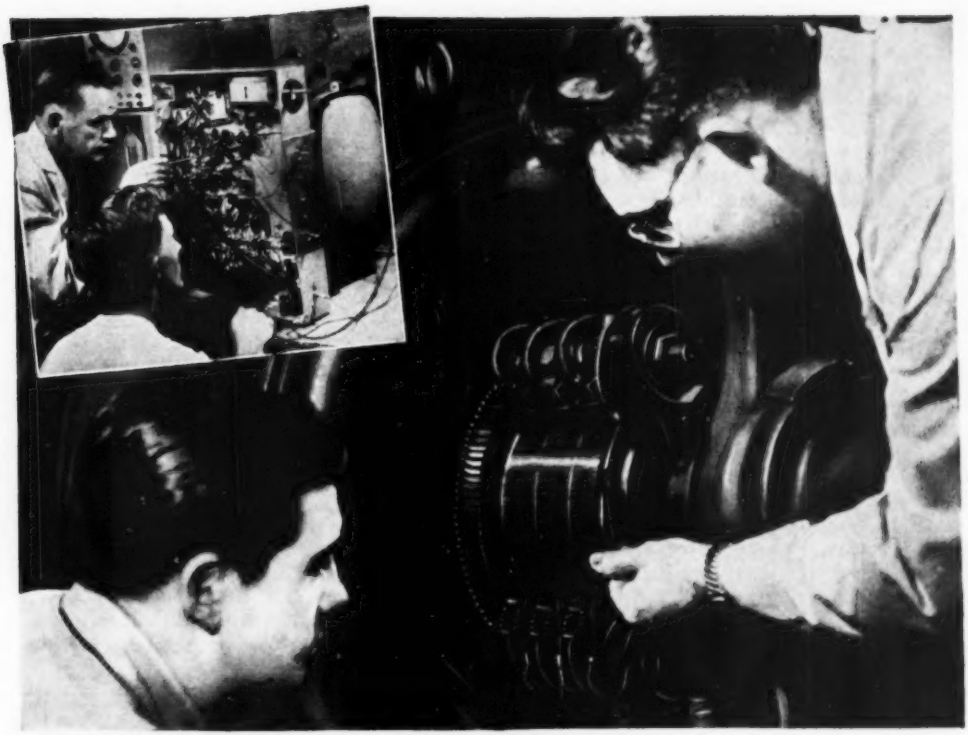
. . . WFBG-TV, Channel 10, Altoona, has 316,000 watts' power.

JOHN W. REIFSNYDER, Millheim, Pa.

. . . WHAS-TV, Channel 11, Louisville, operates on 316,000 watts at the present time.

CHARLES PEEVEY, JR., New Albany, Ind.

We were behind the times. There are now seven TV stations operating on 316,000 watts effective radiated power, and seven others have been authorized to go that high but have not as yet. A UHF station—KTVU, Channel 36, Stockton, Calif.—is authorized



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to use 525,000 watts but is now using only 151,000.

A Case of Exploding Shingles

On page 233 of your February issue, Lucien Greif suggested using an asbestos-cement shingle to protect wood from a torch flame. But such shingles explode violently when subjected to extreme heat. I know, because we had to stop the children from throwing shingle scraps into the barbecue fire, for fear of flying pieces.

JOHN WEBSTER, Islington, Ont.

The scraps were probably water-soaked. In a sufficiently hot fire, trapped moisture turns to steam too fast to escape, and so bursts the shingle. A dry asbestos-cement shingle may safely be used.

New Use for an Oven Door

The good old kitchen stove came to my rescue when I wanted to fold a piece of sheet metal in a hurry and didn't have a hand brake, folder or bench vise with angles around. I used the oven door, holding it shut on the metal with one hand, then lifting the rest of the metal to the desired angle with the other hand. Presto! I had a perfectly straight and kinkless fold. I even used the door to flatten the fold, just as I would do with a hand brake.

JOHN SAHULKA, Cicero, Ill.

Where to Find Lead Paste

In your March issue [p. 250], you featured a shop tip to use white or red lead in a tube for lubricating lathe points.

The idea is excellent *if* you could obtain either white or red lead paste in tubes. Local paint and artist's supply stores don't carry them, but nearly all have zinc paste in tube form. I am beginning to suspect your Mr. Joseph Tracy is using *that*. Perhaps it will work. I don't know, but it would be hard to convince any veteran lathe hand who has put his confidence in lead paste for the job, be it either white or red.

RAY HAMPTON, Fullerton, Calif.

Ask one of those art-supply stores for Grumbacher's "flake white" in tubes. This is a basic lead carbonate (white lead) in pure linseed oil, with a small percentage of aluminum stearate. It makes a good center lubricant for lathe work.

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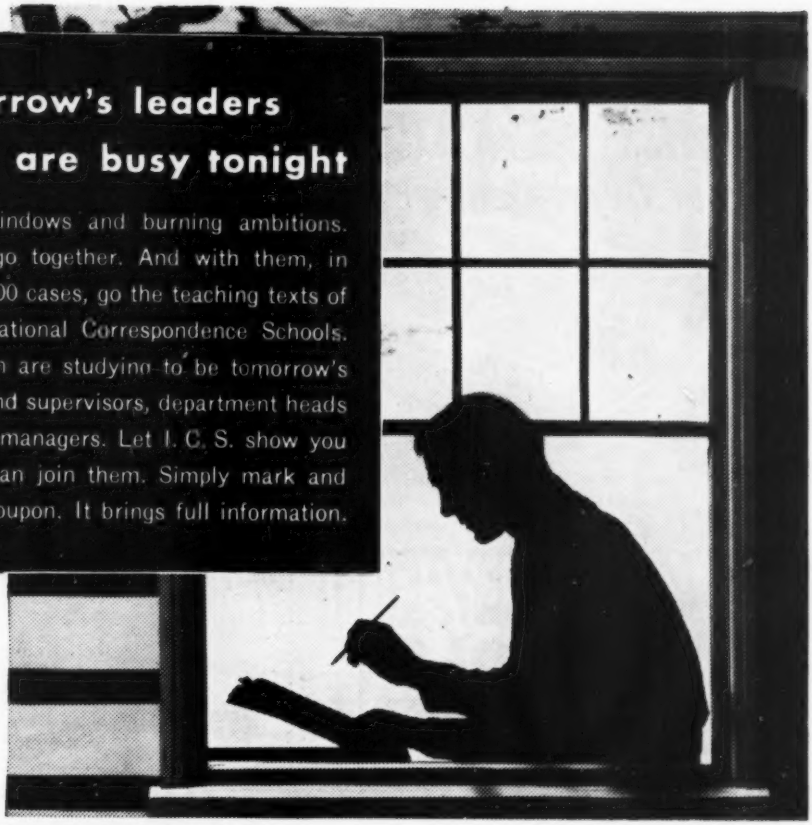

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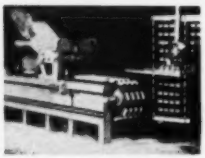

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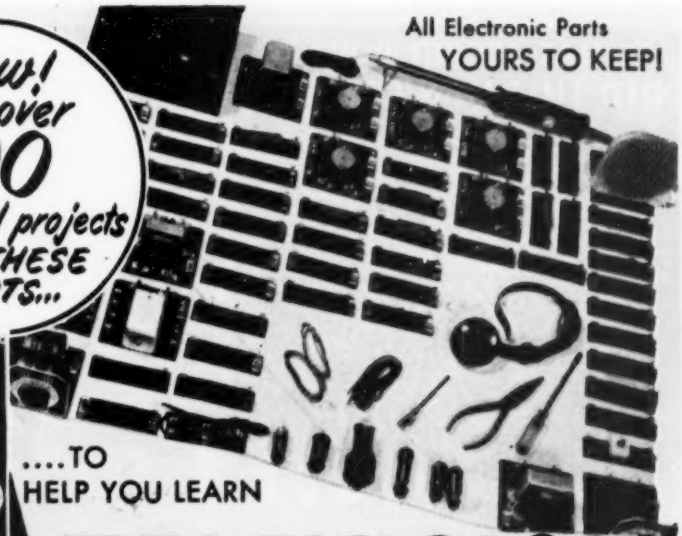

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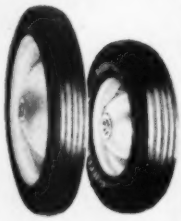

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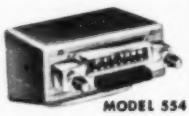

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700-16	6.24	800-15	6.24	600-20	8.24	1000-20	16.84
700-16(6)	7.24	820-15	6.24	650-20	9.74	1100-20	17.84
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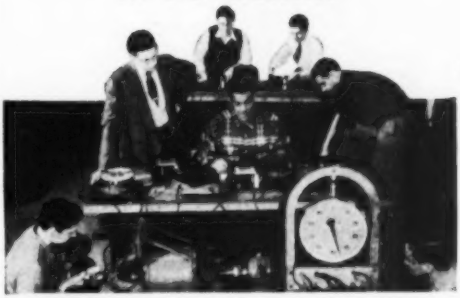

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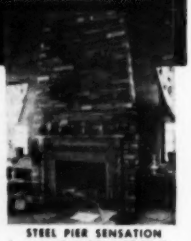

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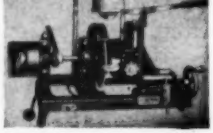

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700x16	6.15	760x15	5.75	750x15	10.45	900x20	17.65
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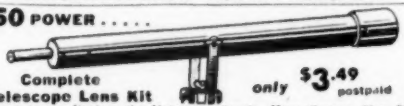

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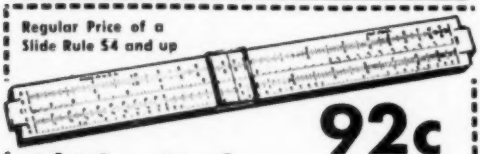

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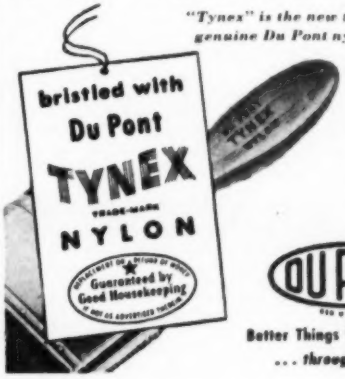

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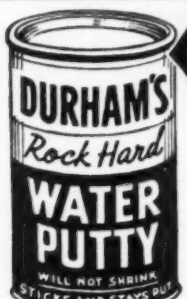

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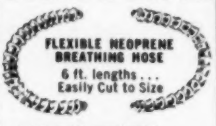

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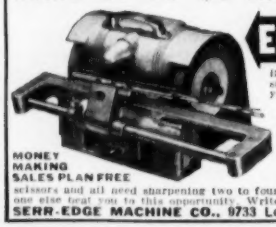

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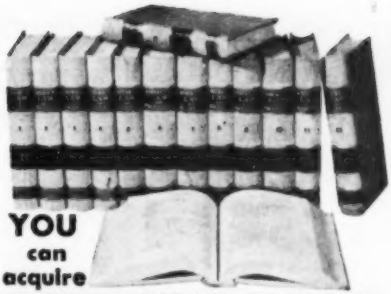

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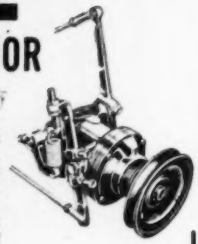

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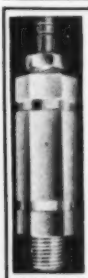

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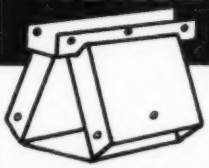

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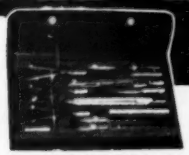

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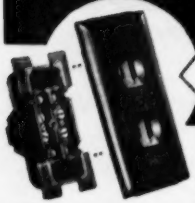

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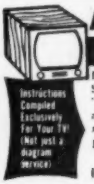

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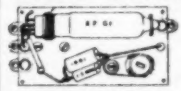

"DELUXE MIDGET 1" RADIO CONTROL (CONSISTS OF LICENSE FREE BAND TRANSMITTING RADIO & RECEIVING RADIO) & & CONTROLLING EQUIPMENT LONG RANGE, TO OPERATE MODEL AIRCRAFT, BOAT & AUTO MODELS. ALL THREE UNITS ABOVE SIMPLE ASSEMBLY WITH OUR PARTS & PLANS $9.98

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engine shampoo

QT. SIZE CONCENTRATE MAKES 2 GALLONS

Takes cling out of oil and grease . . . emulsifies it . . . so that all dirt may be hosed off as easily as you rinse hands under water faucet.

Launders engines faster, more completely, and safer than steam cleaning (warm the engine). Self scouring action brings out factory new appearance . . . provides accurate visual inspection . . . Gunked engines run cooler.

Get Genuine Gunk in quart and larger sizes at better wholesale auto suppliers throughout the country . . . Flatly refuse imitations.

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PRACTICAL. Easy to operate—No spring recoil—No pumping. Uses low cost Soda Cartridges Cal. .22 Benjamin H-C Pellets and Darts.

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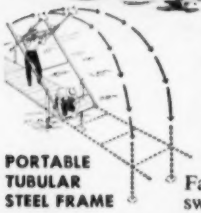
for LODGES, CAMPS, RESORT HOMES

FOSTER PORTABLE PIER

INSTALL IN 2 HOURS
Without standing in water and without boats



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Written up in Life—the answer to all dock problems. Simply take it down each winter, reinstall each spring. Rustproofed—delivers ready to install complete with wood decking & jack for adjusting height.

Fast pivot assembly lets you swing each section into position.

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FULLY GUARANTEED

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2 TELEPHONES 2 BATTERIES PLUS 100 FEET TELEPHONE WIRE

Not a toy! Professional quality—Operates up to 1 mile as clearly as your regular telephone. Made of telephone black break-resistant polystyrene. Perfect for construction gangs, farms, factories, offices, homes or any point-to-point communications.

No. 20A947 . Complete ....$3.50 Postpaid.

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NOBODY LIKES TO ADD & SUBTRACT FRACTIONS

DIALS LIKE A TELEPHONE

Get a **Fractionator** "IT ADDS AND SUBTRACTS FRACTIONS"

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Direct reading. Answers in Fractions & Decimal Equivalents. 100% Accurate. Handles all Engineering Fractions.

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Newest, finest 16mm still camera . . . Minicord combines all advantages of the best minicams with many new advancements . . . Roof-prism focusing through 1.2 power telescope produces clear upright image; Goerz Helgor f:2 coated lens; automatic one-hand operation; magazine loading; 10 x 10mm picture on 16mm film gives splendid enlargements. Incomparable gift . . . At leading stores $84.50, incl. case. Write for interesting booklet S.

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NEW HULL AUTO COMPASSES ARE EASIEST TO INSTALL

Beaconlite $6.95 SEREAMLINE $4.95

● Greater accuracy and a patented, more positive means of compensating against magnetic interference have long kept Hull Auto Compasses first with America's motorists. Now, choice of a new vacuum cup mounting bracket with special adhesive, or the original clamp type, gives greater-than-ever ease of installation.

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GREATEST BARGAIN VALUES for America's Greatest Sport!

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APPROX. UNDERWATER TIME 1 HOUR

Complete Double Hose Assembly Included if Preferred . . $2 Extra.

BOTH UNITS READY TO USE
BOTH UNITS COMPLETELY AUTOMATIC
No Underwater Adjustments
For Fresh or Salt Water

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Mine Safety Appliance Co. *Automatic Demand* Regulator* releases air or oxygen only as needed at a pressure identical to that of surrounding water. Heavy, forged, silver-soldered manifold connects 2 high-pressure tanks (295 cu. in. vol.; 22 cu. ft. press. cap.) fitted with easy acting shut-off valves. Exclusive adjustable steel cradle and harness hold tanks in correct position. A special shut-off valve at mouthpiece prevents water from entering hose. Unit is specially designed to stand upright for filling, testing, and storage. Same open-circuit type unit also with single tank for 59.95.

Complete with following accessories: 2" chrome test-gauge, wrench, and instructions.

RE-BREATHER TYPE

One of the finest Oxygen Re-Breathing sets ever offered for shallow water diving (to 35 feet). Brand new U. S. Navy Surplus, made by Mine Safety Appliance Co. Complete with all accessories and instructions: 2500# pressure gauge (radium dial); nylon adjustable harness won't shrink or rot; quick release buckle; wrench; extra cannister. Unit is made of aluminum and non-ferrous alloys completely rust-proof. Baralyme Chemical type — amazingly economical automatic demand mechanism. 2 hours underwater time.

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MODEL 1-UCO, shown, features 1½" square axle of solid steel; 2500 lb. capacity. Comes completely equipped, except for tires. List price $65.29, Fed. Ex. Tax included, F.O.B. Wausau. Other models to 5000 lb. capacity. We manufacture a complete line of trailer axles, couplers and jacks. Write for Brochure 14-FX

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"As old as the Industry!"
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You Can Be a Manufacturer of Gardencrete

Set of 18 Flagstones (below). Sells for $8.25. Costs to make, $3.00. Your markup, $5.25.

Your spare-time manufacture of Gardencrete can lead to a full-time business, with broad sales potentials and generous income possibilities. A small investment buys the Colorglazing machine and a few molds. Add more molds as your business continues to expand.

Gardencrete has wide sales appeal wherever people have pride of lawn and garden. Colors are fused on under air pressure. Stay put for years and years. Choice of 30 colors.

Your mark-up on basic costs is 200%—300%. Products easily made in shed or garage. We supply full instructions. Write for literature and information on costs and selling prices on complete line.

Bird Baths
Jars and Vases
Flower Boxes
Flagstones
Lawn Seats

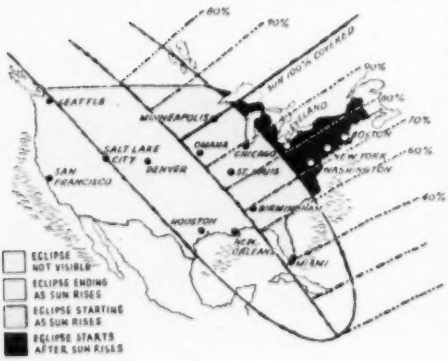
Colorcrete Industries, Inc.
711 Ottawa Ave., Holland, Mich.

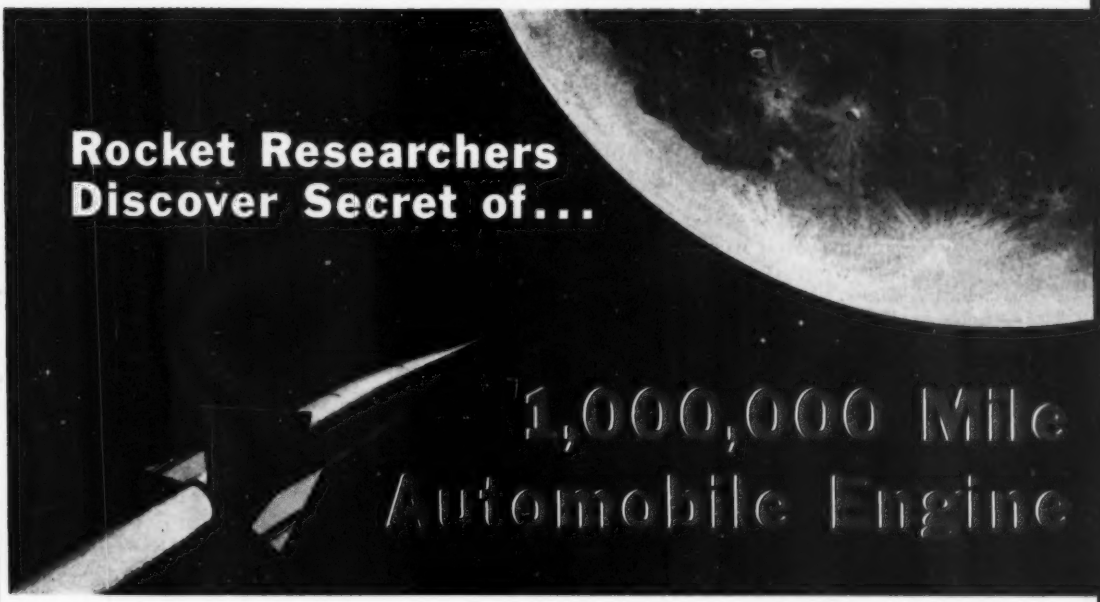
POPULAR SCIENCE MONTHLY'S . . . **Last minute news & notes**

A BLUE AND YELLOW TWO-TONE CAR SHOULD BE SAFER TO DRIVE, it appears from research at UCLA. Certain colors make objects seem to be closer. The difference is as great as six feet--enough to avert an accident. Blue, it turns out, is most easily seen in daytime or fog, yellow best at night...The newest automatic elevator figures out how long to keep its doors open by counting the passengers entering or leaving (an electric eye does that) and adjusting to the flow of traffic. Westinghouse makes it.

JET PLANES THAT KILL WITH "NOISE" have been suggested by North American Aviation's chief engineer. He points out that the sonic boom--the explosion-like shock wave created by a supersonic plane--could do as much damage as a 140-m.p.h. hurricane...A new radio-controlled map automatically traces a pilot's route. If he flies out of the area covered by the map, the moving pen stops, but a special circuit remembers where he goes so the pen can start again at the right spot when he flies back onto the map. The device is made in Britain by Decca . . . The 213 students who took a televised course on Shakespeare (they stayed home but got college credit) did very well, reports their professor, Dr. Frank C. Baxter of the University of Southern California. They even scored a few more B's than campus students did.

YOU'LL GET A RARE VIEW OF AN ECLIPSE OF THE SUN June 30--if you get up early enough. Almost all of the U.S. east of the Rockies (see map) can see at least part of this awesome spectacle, but it will all be over by early morning. In Philadelphia, for example, this is the timetable: At 6:05 the moon will begin edging across the sun; by about seven it will obscure three-fourths of the sun and begin moving off; by 7:57 Old Sol will be shining full again. Minneapolis is the only American city to see the sun totally blacked out (around five a.m.) with day dramatically turned back into night. (A WORD OF CAUTION: To avoid eye injury, watch the eclipse through several thicknesses of completely blackened photo film. Sunglasses are not enough.)





Your Present Engine Can Last Years Longer . . . Thanks to New Sintered Bronze Filter Method!

THIS IS THE SECRET that wouldn't keep—the invention that may put men on the moon years before experts believed it could be done. This is the discovery that can make present-day automobile engines last hundreds of thousands of miles—and save millions of dollars for average car owners by reducing operating expenses. Yet, like many great discoveries, it is based on simple principles.

Friction, as every schoolboy knows, is what makes engines wear out. In early steam engines, this was such a minor problem that tallow was good enough for lubrication. Even in the first gasoline engines, almost any kind of oil could do the job.

But as engine heat increased and piston speeds approached 3000 feet per minute, lubrication engineers had to develop new oils containing "additives" you hear so much about.

Oil companies claim these additives are worth the extra 15c to 25c a quart you're paying for oil—and they're right. Purpose of these additives is to keep carbon and gum in harmless suspension in your oil—prevent deposits from forming in your engine. That's why your oil should look dark after a few miles of driving.

But here's the catch: the ordinary absorbent-type filter soaks up these valuable additives like a blotter. The more additives your oil filter soaks up, the "cleaner" your oil looks—and the more carbon, gum and varnish you may have forming in your engine.

Shocking? Yes, but that's only part of the story. Oil companies have developed still other additives—such as barium and molybdenum—which may make an engine overhaul something you don't even start thinking about

a four page report on the most important lubrication discovery in a lifetime!

until 250,000 miles or so. But there was no point in putting these oils on the market until an oil filter could be developed that would not remove additives. True, a few of these additives are already on the market in limited quantities—but, again, they are ineffective as long as they are being soaked up in absorbent filters.

The problem: find a filter that wouldn't soak up valuable additives, but would remove the microscopic abrasives that do the real damage to precision engine parts. These "danger zone" particles range from 10 to 30 microns in size (a micron is 39 millionths of an inch)—so small that several hundred of them would simply rattle around inside the period at the end of this sentence.

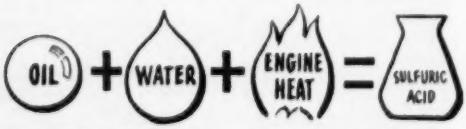
Since conventional absorbent filter material couldn't be packed tight enough to stop these tiny particles without reducing oil flow, engineers decided an entirely new kind of filter material had to be developed. Obviously, it had to be metal—but there was no way of making a metal screen fine enough.

Finally, metallurgists found the answer by fusing together millions of tiny bronze balls into a porous filter. Being non-absorbent, it wouldn't remove additives, yet abrasives simply couldn't get through the spaces between the tiny bronze balls. And, since bronze just doesn't wear out, it would *never have to be replaced!*

Tests Prove Life-time Filter Adds Years to Engine Life

Samples were rushed to government proving centers for testing. Results: the Life-time bronze filter not only solved the critical problem of filtering liquid oxygen, nitrogen, etc., for guided missiles, but could save the government millions of dollars now spent on filter replacement packs for trucks, jeeps, tanks and other vehicles.

Besides government tests, millions of miles of road tests in truck, taxi and car rental fleets reveal amazing results. Cars equipped with the Life-time filter have already passed the 300,000-mile mark *without ever changing oil filters!*



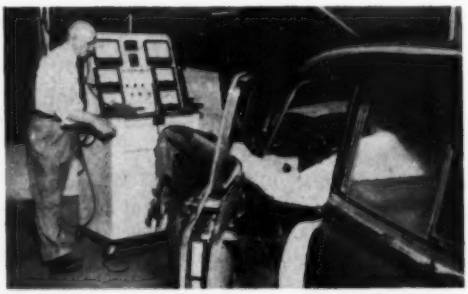
By removing water from the oil, the Life-time filter prevents formation of sulfuric acid, deadly enemy of bearings, other precision engine parts.

Micrographs Reveal How Ordinary Cloth or Paper Filters Let Abrasives Get Through

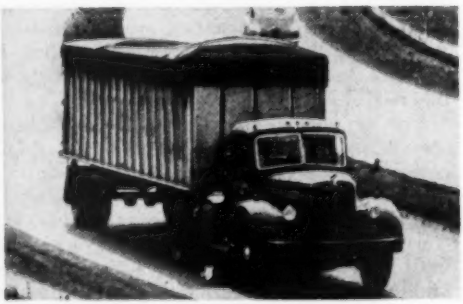
1. After 200 miles, unfiltered oil looks like this. Dark color is normal; it means detergent additives are keeping your engine clean. But abrasive particles are dangerous, should be filtered out.

2. Ordinary cloth or paper filters soak up additives, but let some abrasive particles get through when pressure forces "channels" in pack.

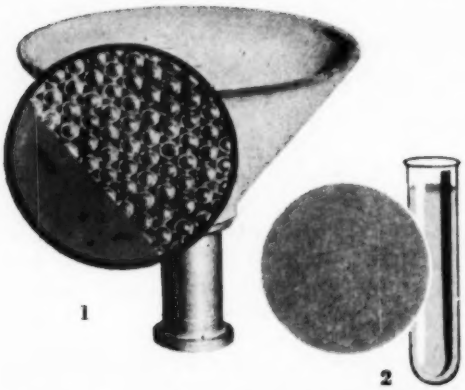
3. Because additives are removed, oil may look "clean" because carbon and gum are deposited in engine. Dangerous abrasives are still in oil.



250,000 MILES before a major overhaul should be normal with today's engines and oils. The Life-time bronze filter meets modern requirements.



DIESEL AND GASOLINE truck fleets have proved value of Life-time bronze oil filter in hundreds of thousands of miles of road tests.

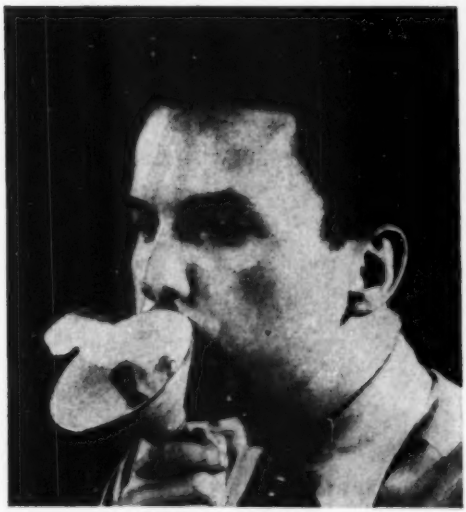


1. Since porous bronze can't "channel," abrasives can't get through—but valuable additives can, because Life-time filter is non-absorbent.

2. After 2,000 miles—or 10,000—oil is free of abrasives, but dark, proving engine is clean. Dark oil means a clean engine, just as dirty water means clean hands.

How The *LIFE*-TIME Filter Works

As dirty oil is forced through element, all harmful particles drop to bottom of filter case. Only pure, filtered oil can get back into circulation.



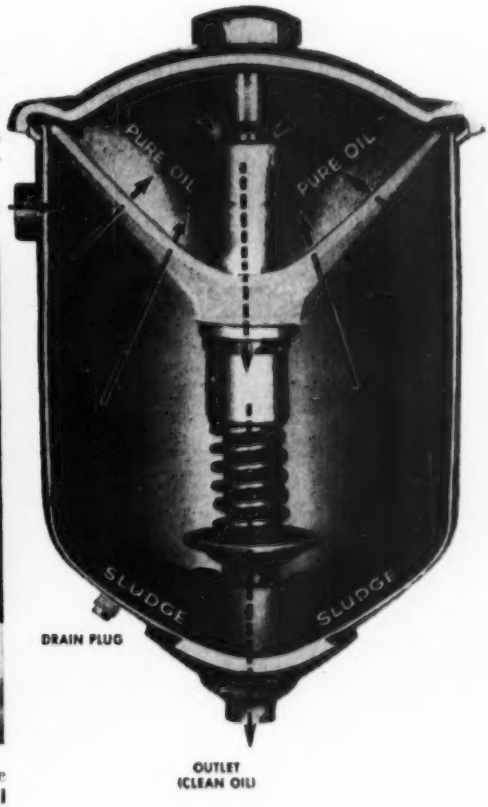
"SMOKE TEST" proves superiority of Life-time porous bronze filter. Ordinary filters cause oil pressure to drop when fibers soak up oil, expand and prevent free circulation.

Life-time Oil Filter Never Wears Out - eliminates filter pack replacement forever!

You never change the Life-time filter—just rinse it occasionally in gasoline and it's good as new. In addition, you save the quart of oil soaked up and thrown away regularly with ordinary replacement filter packs, which can add up to a lot of oil during the life of this filter. How long is that? Well, the Life-time filter is guaranteed for 10 years.

But since bronze simply never wears out, the amount of money you save on the filter packs you don't have to buy, plus what you save in engine overhauls, is something for your life insurance man to figure out for you.

To find out how you can have a permanent bronze Lifetime filter on your car, see next page.



Try a Life-time Filter for 2 Weeks in Your Car or Truck

You can try a Life-time filter in your car for two weeks to see if it's really all we say it is (it is, and more). If, however, you decide you don't want to keep it because you miss the fun of buying filter packs, or for any reason, all you do is send it back for a refund, with no questions asked. Ordering is simple:

1. If your car already has an oil filter, you can convert it to a Life-time filter with a kit which replaces your throwaway pack with permanent bronze. Just send us the make and number of your present filter pack (if you know it); otherwise, send us the make, model and year of your car or truck. Enclose $6.95 (we pay shipping) or send $2.00 deposit (you pay balance and C.O.D. charges on arrival).

2. If your car has no filter now, or you want to replace the one you have, send us the make and model of your car and $12.95 (we pay shipping) or $5 deposit, balance C.O.D.

3. A few cars have full-flow filter systems; Life-time filter conversion kits for these are $13.95.

FREE INSTALLATION

Although you can install a Life-time filter yourself in 15 minutes, take it to your dealer if you like and we'll pay him for his trouble.

Use the order form below for immediate delivery—and do it today, before you waste another cent on filter pack replacements!

Permanent Filter Division, Dept. FPS-6
Continental Manufacturing Corp.
Washington Blvd. at Motor Ave.,
Culver City, California

Rush Life-time filter for:

Make, model, year of car _____

_____
Present filter make and model (if known)

I enclose

☐ $6.95 for conversion kit (full flow, $13.95); factory pays shipping.
☐ $2.00 deposit for conversion kit; send C.O.D.

☐ $12.95 for complete unit ($18.95 for chrome); factory pays shipping.
☐ $5.00 deposit for complete unit; send C.O.D.

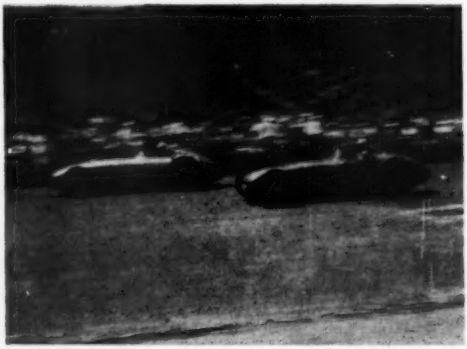
Name _____

Address _____

City _____ Zone _____ State _____

1. CONVERSION KIT replaces present filter element with Life-time bronze.

2. COMPLETE UNIT replaces entire old filter unit in 15 minutes.



INDIANAPOLIS "500", Panamerican Road Race, other international sports events are sponsored on network radio and TV broadcasts by Continental Manufacturing for Life-time filter.

Opportunities Now for Life-time Filter Dealers and Distributors

A dealer and distributor network is now being formed to handle demand generated by 4-page advertisements like this published in leading national magazines, plus sponsorship of radio and television broadcasts of the Indianapolis 500 and the Panamerican Road Race.

These valuable dealer and distributor franchises are not being sold; they are being awarded on the basis of ability to grow with us in the most ambitious expansion program in the industry.

For complete information on how you can be first with the most exciting automotive product of this decade, write or wire:

Continental Manufacturing Corporation
Dept. FPS-6, Washington Blvd. & Motor Ave.
Culver City, California

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POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly

"You Save Gas By Safe Driving"

A junior economy race teaches teen-agers the same tricks that win the big Sun Valley run.

By Andrew R. Boone

THE idea that teen-agers are wild drivers dies hard. But in Stanislaus County, Calif., people now know better.

From nine high schools, 229 boys and girls set out recently in their own economy run. They drove cars ranging from jalopies to '54 sedans. Each drove a me-

WINNER OF THE HIGH-SCHOOL SWEEPSTAKES, Martin Marshall (left above), receives the grand award from Earl Campbell, regional director of the National Safety Council. Driving a '50 Studebaker, Marshall averaged 34.1935 miles per gallon. In ton-miles he achieved 57.4452—only a shade less than the winner's record mileage in this year's big Sun Valley Economy Run (page 84).

Everything from jalopies to 1954 models were entered in the contest. In Modesto, largest

DORWEN STINNETT, 17, watches as his car is gassed up. After the run, the tank was refilled up to the ice-pick mark scratched on by the official at right above.

FOUR BOYS lend their brawn to push a station wagon up to the starting line. As one car starts away, another one is pushed up. Cars are run off at one-minute intervals.

andering 106-mile course that included both country roads and city streets. A 3½-hour maximum time limit required reasonable average speed, and an observer in each car was ready to penalize infractions of the rules, such as light-jumping or coasting.

Martin Marshall, a 19-year-old high-school senior, took the sweepstakes cup by easing his '50 Studebaker around the course at an average of 34.1935 miles per gallon. His performance underlined the moral: You save gas by safe driving.

Marshall was tickled silly by his record. "It goes to show," he grinned, "that digging out really takes gas."

The story of this safety-economy run belongs equally to the young drivers and to the people who put it together. Most of the county got behind the run.

Investigator Starts Ball Rolling

You've got to give credit to Bela Clark first. Clark, chief juvenile investigator in the sheriff's office at Modesto, the county seat, has to handle youngsters who get into trouble on the highways. Not long ago he read of an economy run conducted in a single high school. Clark figured that if one was good, several would be better, and he dreamed of a big event that included every high school in his county.

Last winter Clark began to spark-plug his idea. He got the National Automobile Club and the General Petroleum Corporation to promise to lend expert help and to furnish some prizes. He canvassed

town on the route of the safety-economy run, the cars were lined up three abreast (above).

high schools, service clubs and police departments.

Rules patterned after the big Sun Valley run were drawn up. Driving licenses were a must. Cars had to be covered by liability insurance; and they had to be owned by the entrants or their parents—no borrowed jobs allowed. Except that dual stock mufflers were permitted, cars had to be strictly stock.

To level out the differences between cars and put the biggest emphasis possible on driving skill, the ton-mile formula was used. In this computation the total weight of car and occupants in tons is multiplied by the mileage covered, and divided by the exact amount of fuel consumed.

An observer in each car—not a relative—rode with each youngster to note any rule violations on a signed report. Penalties for declutching with the car in motion (other than in normal shifting), for coasting in neutral, for jumping red lights or stop signs, and for failure to use hand signals were assessed for each infraction at the rate of a tenth of a gallon of gas added to actual consumption. Taking a short cut, getting a police warning, adding fuel, or exceeding the time limit brought disqualification.

Racers Get Out Early

At seven in the morning on the day of the run, all 229 entrants presented themselves at nine starting and finishing points around the course. Papers were checked, cars filled up with gas to a

MAP SHOWS the 106-mile course and the location of nine of the high schools that participated in the contest. Bela Clark (above), juvenile investigator, spearheaded the event.

ONE OF THE SMALLEST CARS in the run was this copy of a Stutz Bearcat. Entered by Randall Smith, a 16-year-old junior, the car has a '39 Willys motor and chassis.

Studebakers Sweep Big Economy Run, Set New Mileage Mark

EQUIPPED with a standard transmission and overdrive, a Studebaker V-8 Land Cruiser averaged a record 60 ton-miles per gallon to win the top award in the 1954 Mobilgas Economy Run. Said driver Dick Griffith of Temple City, Calif., "We tuned that engine to a gnat's eyebrow, and I imagined I had an unbroken egg under the accelerator."

Studebakers won in all three classes in which they were entered in the 1,335-mile marathon, which involved 188 miles of city traffic and 24 miles with tire chains. A Dodge V-8 placed a close second in the over-all contest.

MAKE & MODEL	DRIVER	MILES PER GAL.	TON-MI. PER GAL.
LOW PRICE (Standard Trans. & Overdrive)			
Studebaker Champion	Dick Johnson	29.5806	56.5138
Ford 6	Les Viland	26.1479	55.5773
Ford V-8	Bill Hooks	23.3884	50.7528
Plymouth	Le Roy Schlick	22.4397	47.7067
Chevrolet	Pete Novotny	22.3167	46.9655
LOW PRICE (Automatic Trans.)			
Hudson Jet-Liner	Lee Hamer	21.6382	43.1249
LOW MEDIUM (Standard Trans. & Overdrive)			
Dodge Royal V-8	Danny Eames	25.3973	58.0456
Mercury	Bill Stroppe	21.4781	49.9795
LOW MEDIUM (Automatic Trans.)			
Oldsmobile Super 88	Willard McCarthy	19.7506	49.7122
Dodge Royal V-8	Art Rene	21.3511	48.5951
UPPER MEDIUM (Standard Trans. & Overdrive)			
*Studebaker Land Cruiser	Dick Griffith	28.1046	60.8465
De Soto V-8	Verne Holmquist	20.3514	49.5558
UPPER MEDIUM (Automatic Trans.)			
Studebaker Land Cruiser	Robert Donkin	24.5763	53.9942
Nash Ambassador Super	Archie Bowen	20.6582	47.7721
Hudson Hornet	Hart Fullerton	19.8481	47.7346
De Soto V-8	Boyd Trombella	17.9770	44.1334
Packard Clipper	Harold Mickelson	17.8957	43.6744
HIGH PRICE (Automatic Trans.)			
Lincoln Capri	Clay Smith	19.7542	52.2894
Chrysler New Yorker	Lew Jabro	17.8322	45.5792
Chrysler Custom Imp.	John Gerfen	16.4463	45.1370
Average—All Cars		21.8466	49.8845

*Sweepstakes Winner

recorded point on each filler pipe, and the over-all weight of each car and its occupants noted down. Beginning at nine, the cars were sent off at one-minute intervals from their home bases. Half went in one direction and half in the other, to prevent bunching up, and the rules required cars to stay 300 feet apart except when passing or in traffic. A small army of officials and mechanics were stationed on the 106-mile course.

Though the atmosphere was outwardly that of a holiday, the boys and girls who were driving were grimly serious. Collectively they piled up 23,574 miles on their speedometers in 3½ hours—and the worst mishap was one flat tire.

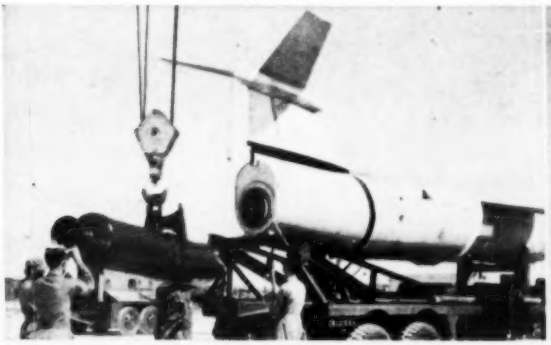
The earnest but enthusiastic response of the youngsters amazed the 70 policemen, sheriffs, and highway patrolmen who officiated. Said patrolman Dwight Bennett: "They certainly proved the value of school driver courses."

Stanislaus County people liked the way it worked so much that they are going to stage a run every year. Scarcely had the news of the event hit the wires when the oil company and auto club began getting requests from other California high schools (87 to date) for help in staging similar runs.

And quite a few persons—Bela Clark is probably one—can see how the idea might grow much bigger, to state-wide eliminations, and maybe even a big national high-school event. END

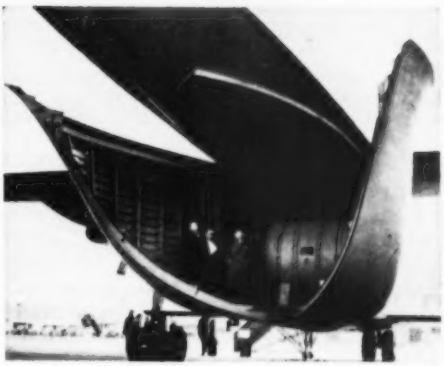
Stratojet Bombers Get Double Power Boost for Tough Take-Offs

THIRTY-THREE rockets are roaring rearward to give this Air Force B-47, six-jet bomber greater power for take-off from shorter fields or with heavier loads. In addition to the 1,000 pounds of extra thrust from each rocket, the engines of this Boeing bomber have a water-alcohol injection system that further increases thrust.



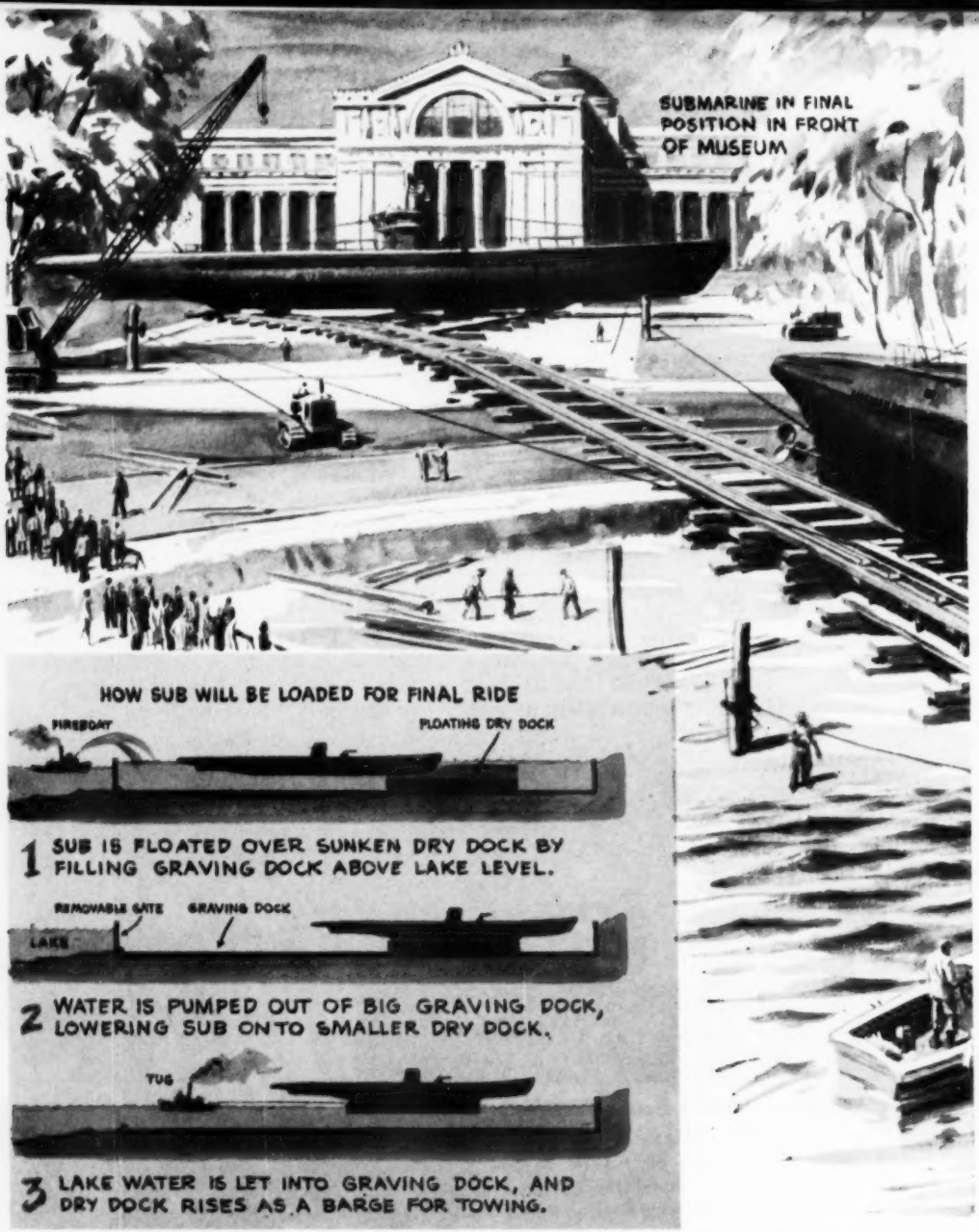
Outboard Helps Push Missile

A ROCKET to add power for take-off is hoisted into the tail of a B-61 Matador. Scientists who developed the pilotless jet bomber (shown poised for launching at right above) see it also as the forerunner of guided missiles to speed air mail.



Air Freighter Opens Wide

WITH 25 tons in its vast cargo hold, the new British four-engine Blackburn Beverley air freighter (right) is said to be able to take off from 3,000-foot runways and almost float down for slow landings.



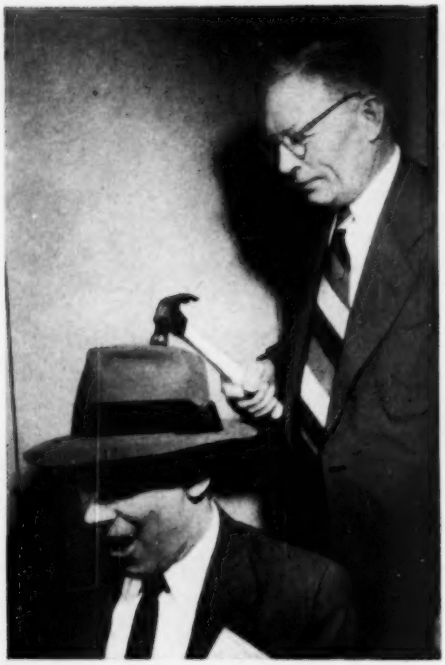
They're Parking a Submarine

THE only submarine ever captured on the high seas will come to final anchorage this month high and dry in Chicago.

There, on July 4, the former German U-505, seized by a boarding party of U. S. sailors during the Battle of the Atlantic, will be dedicated as a memo-

rial to Americans lost at sea in World War II. Public subscriptions are paying for the $200,000 moving job.

Towed to Chicago by the inland water route mapped at upper right, the U-505 will be loaded aboard a floating dry dock, as shown at lower left, for beaching on the shallow shore of Lake Michigan. The larger sketch shows the plan worked out by a retired house-moving engineer, Seth M. Gooder, for the tricky final operation: hauling the 252-foot, 920-ton craft ashore and parking it in concrete cradles as a permanent exhibit at the Chicago Museum of Science and Industry.



Hammerproof Hat Saves Lumps

THIS man is taking a whack from a hammer without fear or pain. He's wearing a plastic safety liner in his hat. Designed for supervisors on construction jobs where falling objects are a hazard, it's made by Davis Emergency Equipment Co., Newark, N. J.

Litters Stack to Form Bunks

A NEW stretcher for accident or disaster cases doubles as a sleeping cot and turns any truck or freight car into an ambulance. Hinge-jointed aluminum legs lock in open or folded position. The Simmons Machine Tool Corp., Albany, N. Y., makes the litter.

Portable Dock Retrieves Boats

THE Army's newest vehicle is a portable marine railway for picking up disabled craft, like the LCVP above. Boats as heavy as 75 tons can be guided aboard on tracks and brought to shore for emergency repairs. The dock leaves the water on four huge wheels.

Slot Machine Takes Dictation

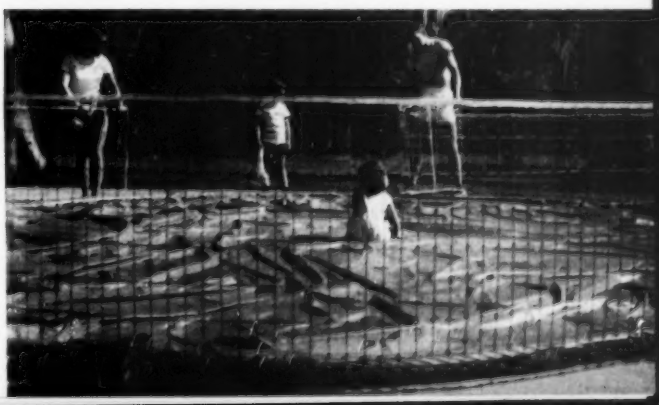
DICTATING booths installed in hotels, railroad stations and airports may soon give traveling businessmen an office away from the office. One quarter in a slot buys a mailer and recording belt. A second coin turns on the dictating machine.

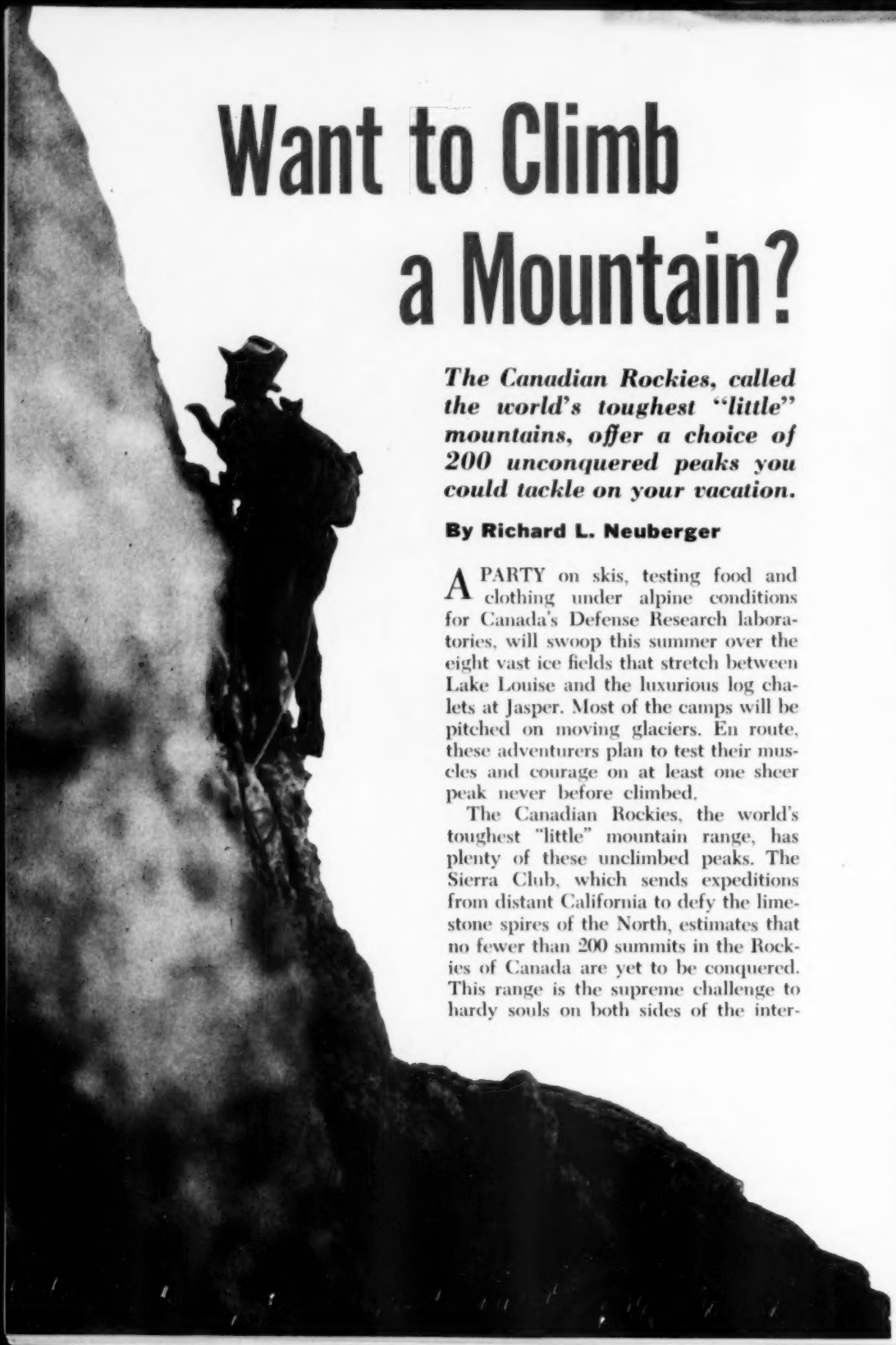
You Don't Need a Hole for This Swimming Hole

IF YOU have 300 square feet of flat space on your lawn and $200 worth of folding stuff in your wallet, you can own a portable swimming pool like the one above. Its sides consist of rigid wire fence that comes in a roll. Its lining is made of durable, heavy-gauge plastic and it resists abrasion by dirt, sand and gravel.

The portable pool, made by Bilnor Corp., Brooklyn, N. Y., is available in four sizes. The largest, shown here, is 20 feet in diameter and holds 7,000 gallons of water.

UNROLLING THE LINING of their new pool, the family above have decided to save time by setting it up on a flagstone terrace. The young boy is leaning against the roll of fence, three feet high, that will form the sides of the pool. At right, the fence has been unrolled and its ends are about to be tied together. An inflatable bumper can be fitted over top to protect against scratches.





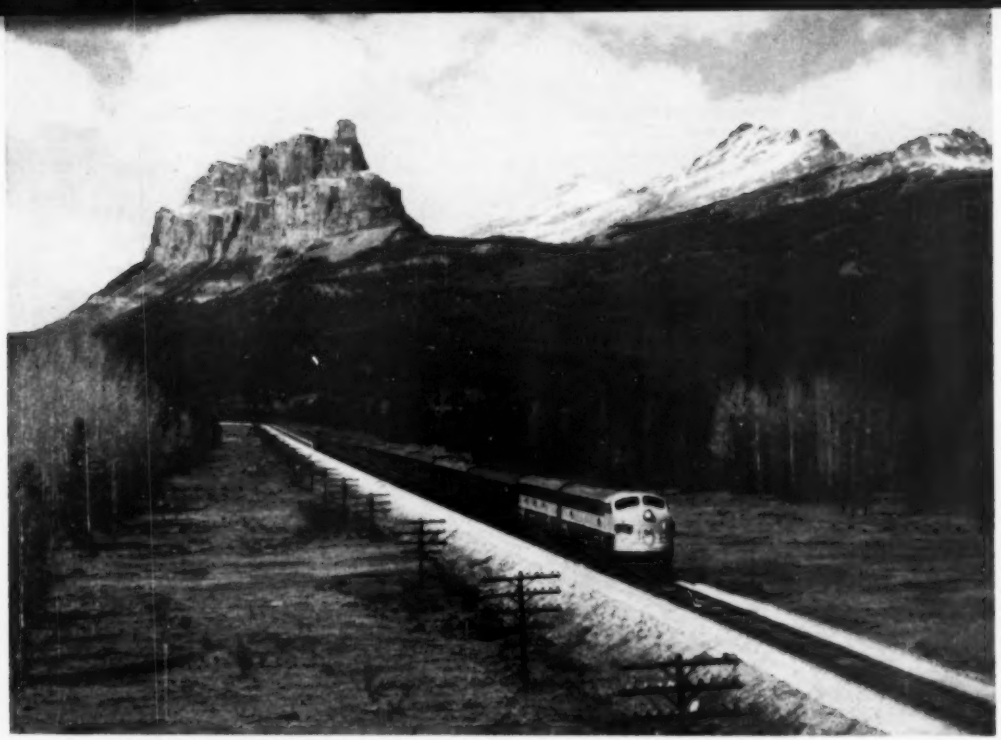
Want to Climb a Mountain?

The Canadian Rockies, called the world's toughest "little" mountains, offer a choice of 200 unconquered peaks you could tackle on your vacation.

By Richard L. Neuberger

A PARTY on skis, testing food and clothing under alpine conditions for Canada's Defense Research laboratories, will swoop this summer over the eight vast ice fields that stretch between Lake Louise and the luxurious log chalets at Jasper. Most of the camps will be pitched on moving glaciers. En route, these adventurers plan to test their muscles and courage on at least one sheer peak never before climbed.

The Canadian Rockies, the world's toughest "little" mountain range, has plenty of these unclimbed peaks. The Sierra Club, which sends expeditions from distant California to defy the limestone spires of the North, estimates that no fewer than 200 summits in the Rockies of Canada are yet to be conquered. This range is the supreme challenge to hardy souls on both sides of the inter-



RISING LIKE A MEDIEVAL CASTLE out of the Bow River Valley, Mt. Eisenhower is 9,030 feet. The final thousand, almost vertical, must be taken with soft-soled climbing shoes.

national border who would gain mountaineering immortality within the limits of a two-week vacation.

Even the peaks that have been subdued are a long way from the staircase category. Mt. Robson, looped like a lariat by the main line of the Canadian National Railways, could not be climbed at all between 1939 and 1953, although dozens of well-equipped parties made the effort.

Steps Up a Tower of Ice

Don Claunch of Seattle, who last summer led the first successful attack on Robson in 14 years, contends that the peak's stratified 8,000-foot face rivals many major mountainsides in the Himalayas and Andes. Claunch chopped innumerable steps on icy slopes overhanging this giddy drop. It was fitting that Claunch should have reached Robson's crest, so long untrod, because he once had been forced to retreat, only 250 feet below the summit, by a fierce gale from the seacoast.

The Canadian Rockies do not begin to qualify for any normal high-mountain league. Robson, loftiest of them all, boasts a mere 12,972 feet in elevation. It would never make the varsity in Colorado, where the tourist passes 14,000-foot summits like pickets on a fence. But many of these relatively low mountains have ramparts as steep as castle walls. Furthermore, the range is still weathering and the rock ledges and holds are loose. An American climber who failed to surmount 8,800-foot Mt. Louis compared his climb to being "on the outside of the Empire State Building, with the window ledges made of cake frosting!"

Some mountains owe their impregnability to remote locations. But Brussels Peak, just off the Banff-Jasper highway, has been humbled only once, and then with so many steel pegs and similar devices that Frank S. Smythe, a famous veteran of the Himalayas, declared stoutly, "I still regard Brussels as definitely unclimbed."

This disputed first ascent of the black

VETERAN CLIMBER FRED D. AYRES, a college professor at sea level, led the only successful ascent of 11,000-foot Mt. Alberta made by North Americans. He considered it tougher than Andean 21,000-footers he has climbed. This summer Ayres may try Mt. Brussels.

pinnacle of Brussels Peak was made in the summer of 1948 by a party headed by Ray Garner of Phoenix. On the final 400 feet of the mountain, the climbers had to construct what was practically a metal ladder of pitons. Twenty-four were used, or one of these steel spikes every 15 feet. Purists were offended by these "synthetic" aids.

Indeed, one of the most celebrated of Canadian Rockies climbers, Professor Fred D. Ayres of Reed College in Portland, Ore., is outlining an assault on Brussels Peak this year which may topple the turret of rock by ordinary means.

Ayres, who teaches chemistry, is a legendary figure along the jagged boundary between the provinces of British Columbia and Alberta. He saved the honor of this continent by leading, in 1948, the only North American party ever to attain the rapier-edged top of Mt. Alberta—after the sole previous ascent had been made by a team of Japanese daredevils, who did it for the glory of their emperor in pre-Pearl Harbor days.

Symbol of Conquest—an Ax

All the drama and glamour of the Canadian Rockies are wrapped up in Mt. Alberta. For generations, men considered this fortresslike wedge of rock—1,500 feet taller than Brussels—utterly

Conquered only twice, Mt. Alberta has turned back some of the greatest Himalayan climbers.

Tallest in the Canadian Rockies, 12,972-foot Mt. Robson has been climbed once in 15 years.

unclimbable. The early fur brigades looked at the 11,874-foot summit in awe. It seemed a realm for eagles alone. Above the lower ramparts, the mountain soared skyward in towering splendor. It was as straight as the front of a vault. But Prince Chichibu sent Japan's six stanchest climbers across the sea, and they made it truly an international project by enlisting the aid of three canny Swiss guides. For 32 hours these nine clung to dizzy battlements. Their hands bled and their feet were numb with cold. But they scaled Mt. Alberta and left behind an ax and a message.

Throughout nearly a quarter of a century brave men tried to get the ax, which was rumored to be of silver. Frank Smythe, the Himalayan veteran, confessed, "Never have I seen any mountain that looked more menacing than Alberta." His party had to retreat a tantalizingly short distance below the top, with their heels suspended over 2,000 feet of empty space. Could even a goat go farther?

But six years ago Fred Ayres and a Cleveland patent attorney named John Oberlin recovered the Japanese ax—which, alas, turned out to be of mere steel, although it is nonetheless now a treasured exhibit in the museum of the American Alpine Club.

Crawling on a Knife Edge

Ayres and his companions chinned themselves up through a series of gaping couloirs, which resembled gigantic elevator shafts hundreds of stories high. The summit ridge, according to Ayres, was "dangerously narrow, with precipitous drops on both sides." Wind currents threatened to blow them into the abyss. It took the climbers two hours to creep along the knifelike ridge to its highest point.

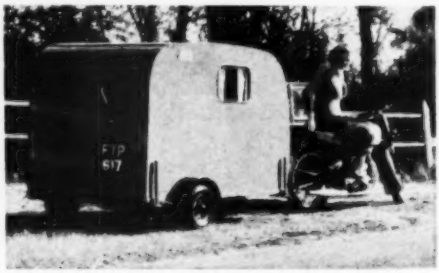
The descent was even more harrowing. Roped together, Ayres and Oberlin inched down the east face of Alberta to a tiny terrace four feet long and two feet wide. It was the most spacious level

[*Continued on page 256*]

Home, home on a raft—that's the theme song of Mrs. Erika Bork of West Berlin. The owner of a trailer and a lover of sailing, she devised the raft above to get the most out of her vacation. Arriving at the raft's anchorage, she puts the trailer aboard and does a little water traveling. A small gasoline motor propels the amphibian trailer.

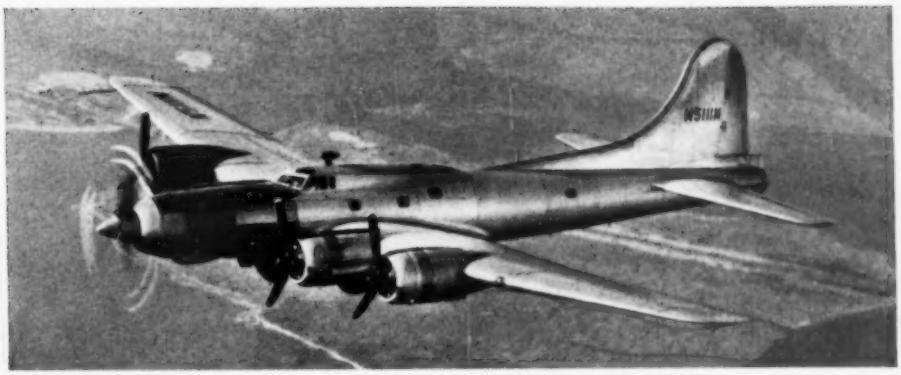
Gypsy Gear From Europe

A motorcycle tow is all you need to hit the road with this bantamweight trailer. Yet it's big enough to sleep two—four with the folding back lifted to form a roof for a canvas shelter. Made of hardboard on a wood frame, it sells in England for about $235.



Portable plumbing for roadside cleanups is a German inventor's idea of what vacation gypsies need. It's a rubber bag with a faucet and basin attached. In use, the private reservoir hooks over the car door and is held steady with suction cups.

Tap the exhaust pipe of your car with this lung saver and you can pump up a sleeping mattress in 40 seconds. The German inventor says the tube filters the lethal gas to prevent you from getting a deeper sleep than the one you bargained for.

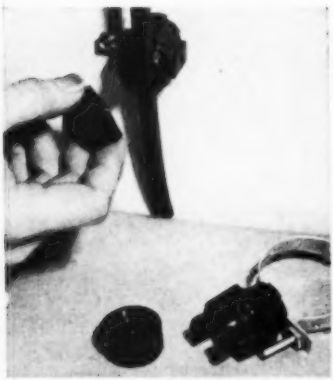


B-17's Fifth Engine Packs More Punch Than Other Four Combined

THIS B-17 feathers its regular props and cuts through space to give a new turboprop a workout. The new power plant in its nose, which will lend 5,700 horsepower to Army and Navy Super-Constellations, packs almost 20 percent more power than the four conventional engines. It combines a Hamilton triblade and a Pratt & Whitney turbine.

Inca Mummy Preserved in Ice-Packed Cave

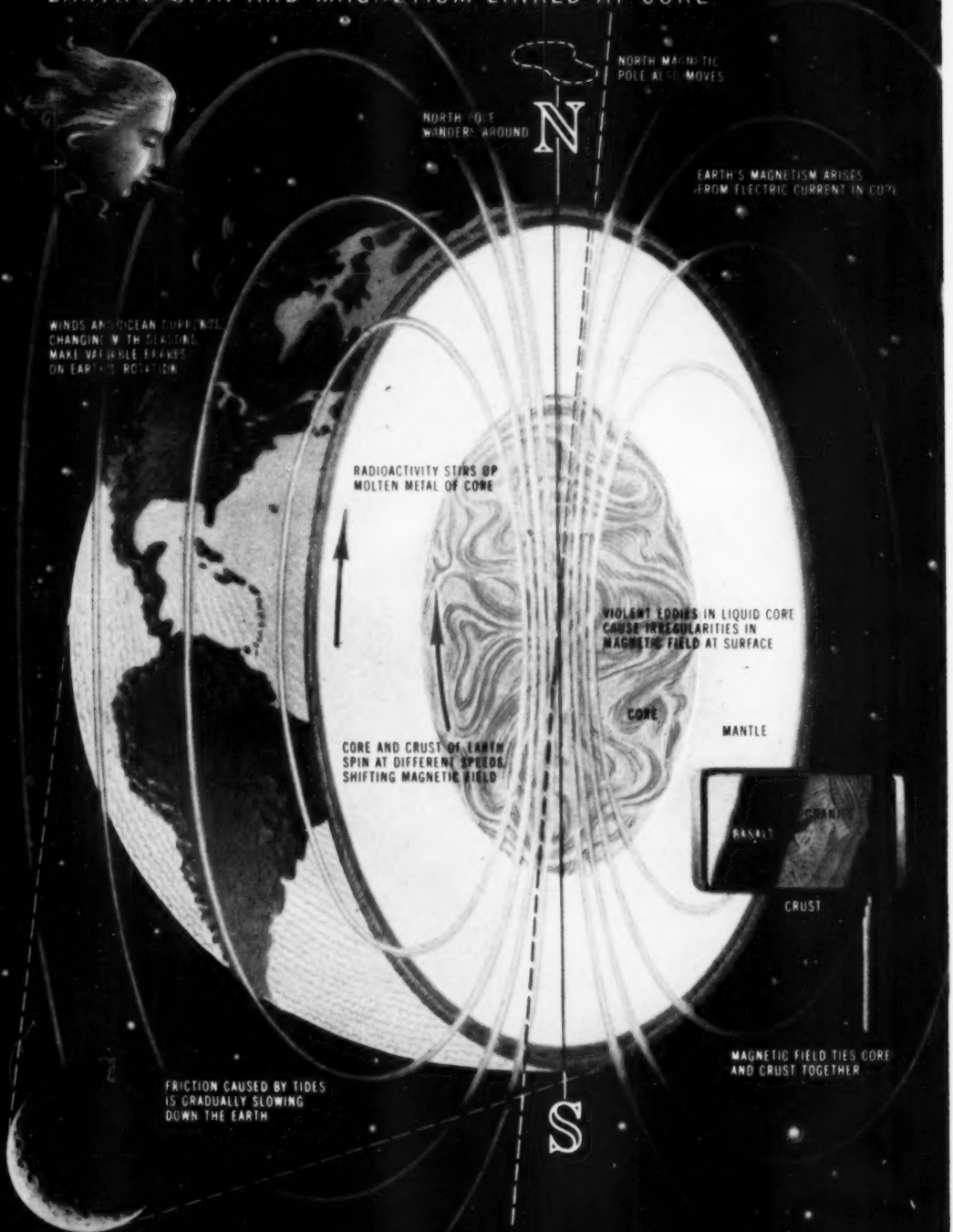
FOUR HUNDRED years of ice kept this Inca child (right) perfectly preserved in all its colorful regalia through the centuries. The 10-year-old prince or princess (scientists aren't sure yet) was found just this way in an Andes cave 20,000 feet above sea level.



Arrester Fits UHF TV

A NEW lightning arrester for UHF TV sets (above) has a screw cap that forces the wire against sharp staples to pierce the insulation and make contact. It is made by RCA.

EARTH'S SPIN AND MAGNETISM LINKED AT CORE



A deadly war weapon showed scientists

What Makes the Earth Wobble

The poles wander, compasses shift, days vary because a heat engine—run by radioactivity—stirs up the earth's core 2,000 miles down.

By Herbert Yahraes

WARTIME research that helped the U. S. Navy overcome a deadly new type of sea mine is paying dividends on an almost cosmic scale. For its findings help answer such old, puzzling problems as—

Why does the earth wobble?

Why are some days too long or too short?

Why does the compass keep changing?

The answers lie in a new idea about what goes on in the middle of the earth—the part called the core, which begins about 2,000 miles under our feet and fills about half of the globe.

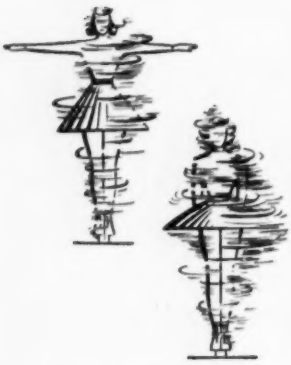
The core is a fiery, white-hot liquid, probably molten iron and nickel. Somewhere inside it, electromagnetic forces equivalent in effect to four sextillion (that's 21 zeroes) one-pound magnets are at work. They make the earth itself a magnet, with its field extending for thousands of miles into space.

The new idea. A heat engine, powered by radioactive material, kicks up turbulent motions in the hot liquid. As a result, the core of the earth rotates at a slightly different speed than the outer part. This in itself accounts for certain irregularities. Others develop when the earth tries to correct for this difference.

Astronomers noticed about a century ago that the earth

TERRA FIRMA ISN'T SO FIRMA. The old globe's axis wobbles, moving the poles around. (The North Pole is headed for Siberia now.) And the earth's magnetism, always uneven, is continually changing. This makes compass reading a fine art and can play hob with land boundaries. Blame for these vagaries is now laid on the fiery core of the earth, a great blob of molten iron and nickel kept hot by constantly exploding atoms.

She Conserves Momentum



Like a skater, the earth spins slower when it stretches, faster when it contracts. That's the law of conservation of momentum

was wobbling on its axis of rotation. They detected the movement by observing a wobbling motion that seemed to be in the stars but was actually in what the astronomers were standing on.

From 1912 to 1918, for example, the North Pole wandered counterclockwise around a circle that was 20 or 25 feet across; in the six years, it made five trips. Irregular movements of this sort are continuing.

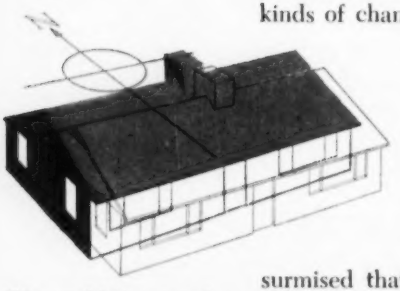
The Pole, of course, is the tip of the imaginary line, the axis, on which the earth spins once a day. When the Pole wobbles, so does the rest of the earth. Your house is sometimes 10 feet farther south than at other times.

The Pole changes not only in its daily position but also in its average annual position. Every year for some years straight it moved a few feet toward Labrador. Then it went back over much the same path. Dr. D. H. Vestine, one of the geophysicists who have done most to explain these movements, reports that the North Pole now seems to be wandering very slowly toward Siberia.

Days are shorter now. Besides wobbling as it rotates, the earth speeds up or slows down and thus makes a day shorter or longer than it should be. Since about 1910 we have been whirling a little too fast. Before that—back to about 1890—we were moving a little too slow.

The changes don't amount to much—not more than a few thousandths of a second a day, a period too small to be detected on a day-to-day basis, but they add up. After studying the motions of the moon and certain planets, Dirk Brouwer, professor of astronomy at Yale, found that at various times during the last 300 years the earth had been off schedule by as much as 30 seconds—sometimes too fast and sometimes too slow.

The Poles Move



The wobbling earth sometimes places your house 10 feet farther south than at other times

Besides these irregular fluctuations, there are two other kinds of change. Tidal friction has gradually slowed down the earth until it now takes two seconds longer to make a complete turn than it did 2,000 years ago. Also, seasonal changes in winds and ocean currents make the earth rotate six-hundredths of a second too slow in May. But neither of these explanations takes care of the irregular fluctuations.

The earth twirls like a skater. Scientists surmised that a basic law of physics known as conservation of momentum was at work. To explain this, Dr. Vestine offers the example of a skater whirling on her toes, her arms out. Suddenly she drops her arms to her sides and picks up speed—because she is more compact.

Similarly, if the earth shrank it would have to go around

faster, to conserve momentum; and if it swelled out, it would have to move more slowly. The formation of glaciers does make it swell, and the melting of glaciers does make it shrink, but these changes take place too slowly to account for the irregularities in the length of the day.

Mines showed the way. It was a World War II emergency that led to the solution of both the wobble and the fluctuating speeds.

The Germans had introduced magnetic mines. These didn't have to be hit to explode: if a ship passed over one, moored deep in the water, the ship's magnetic field provided the detonator.

The Navy called on the Carnegie Institution of Washington for help. One geophysicist from its Department of Terrestrial Magnetism—Dr. Ellis A. Johnson—headed a team that worked out a way to counteract the mines through the use of degaussing coils. These were loops of electric cable running around the ship's hull. Charged with the proper amount of current, they produced a magnetic field that neutralized the ship's own field.

To get the data for this antimine project, another Carnegie geophysicist, Dr. Vestine, headed a team that mapped changes in the earth's magnetic field more accurately than they had ever been mapped before.

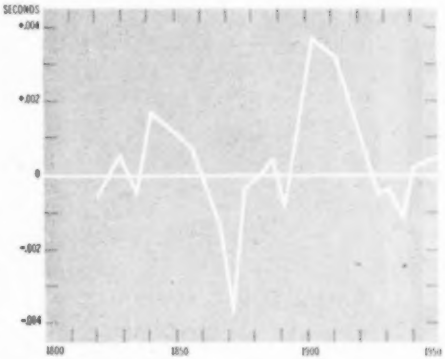
North isn't always north. These changes have been known for three centuries. As an example, imagine a compass with a needle two miles long. For every change of one degree in direction, the tip of the needle moves about 100 feet. If such a compass had been placed in London in 1580, the north end of the needle would have moved 3,200 feet to the west by 1812. Then it would have begun moving eastward and by the present time would have covered about 1,600 feet.

In Washington, D. C., the changes have been much less, at least in recent times. During the last 60 years the tip of such a needle would have moved not more than 500 feet.

Where's that boundary gone? Since plots of land were often laid out by compass, changes in the magnetic field give rise to confusion—and even litigation—about present boundary lines. In eastern New York, for instance, between 1850 and 1950 the needle swung almost six degrees to the west. This means that if your land had been laid out by compass a hundred years ago and you tried to resurvey it

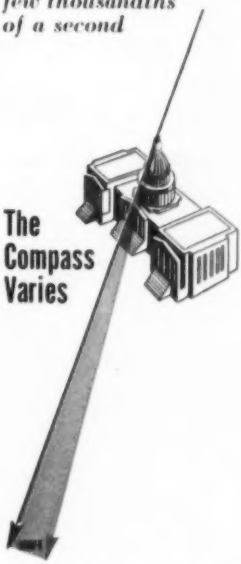
[*Continued on page 262*]

The Days Change



The error in what should be 24 hours has been as much as half a minute, but is usually only a few thousandths of a second

The Compass Varies



In Washington, D. C., a two-mile-long compass needle would have shifted 500 feet during the past 60 years

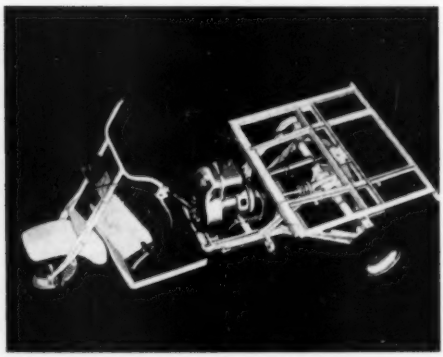
Pin-Up Picture Shot Big as Life On Huge Negative

THE huge photographic negative at left, said to be the largest pin-up negative ever made, measures 30 by 40 inches. It was recorded on Du Pont's new "Superior" Press film, which has a daylight speed index of 200, a tungsten-light speed index of 160.

The giant picture was taken by Peter Gowland, Hollywood photographer, with a "walk-in" camera—two rooms, with a 42-inch lens mounted in the wall between them. Gowland reported that the assignment was difficult because the depth of field for the 42-inch lens was less than three inches. This was especially awkward for taking a shot of rapid action.

Gloves Begin Life with a Jolt

A CHARGE of 10,000 volts is built up inside linemen's new rubber gloves at the rate of 1,000 volts a second in the cabinets above. If the electrical leakage from any glove is more than 10 milliamperes, the glove is rejected as unsafe.



Baby Truck Has Shaft Drive

THIS three-wheel light delivery vehicle, a Cushman Truckster, previously had a chain-and-sprocket drive and a front-mounted body. The new model is built like a car, with shaft drive, auto-type differential and a three-speed transmission.

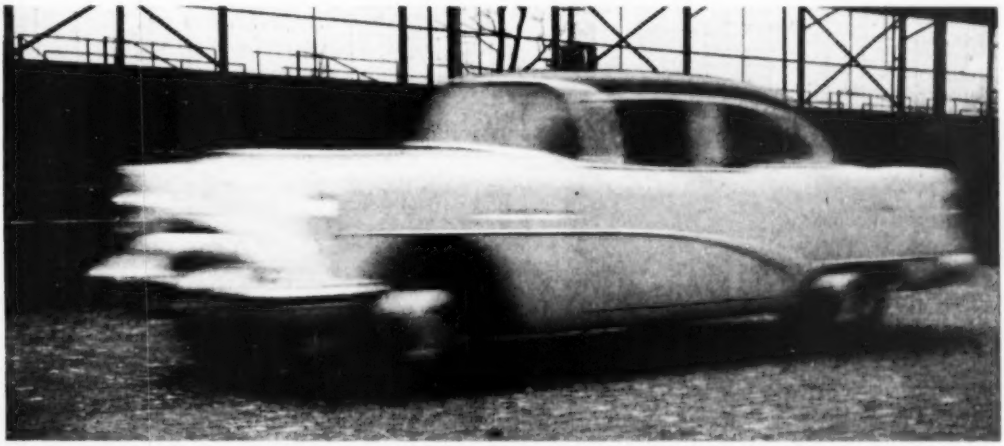
Buick's New Century Is for Smart Drivers

With 200 Roadmaster horses packed into the Special's body, this charger champs at the bit.

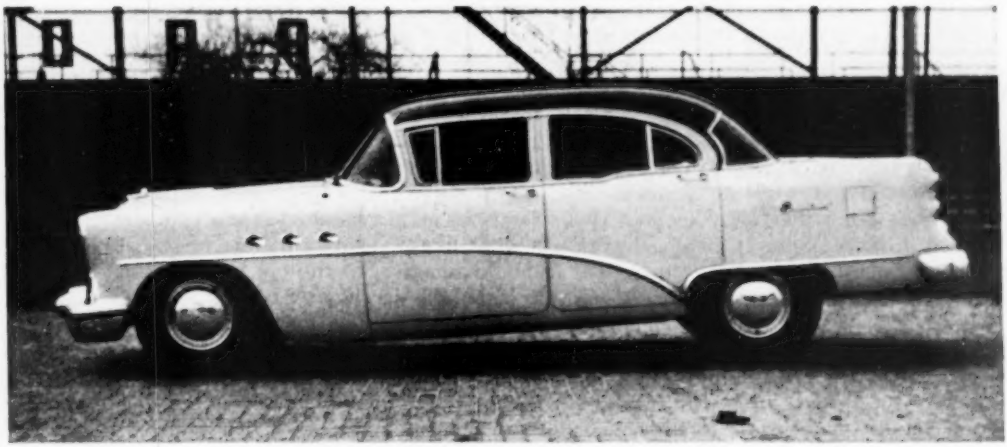
By Wilbur Shaw

THE New York Central calls its crack train the 20th Century Limited. The Buick people like just plain Century for what may prove to be *their* hottest number.

General Motors' second most produc-



You can get her up to 60 in 12.3 seconds, up to 80 in 18.6 . . .



. . . and she'll stop on a button. I made five fast stops from 90.

BODY FEATURES on both the Century and Special are the same. Handy aircraft-type heating - ventilating controls are tied up to the cowl air intake.

SEAT ADJUSTMENT (left) is a cinch with the wide, gondola-like body. You can easily slide your hand down to the button without opening the door.

tive division has rolled out a real power package in this revival of a prewar speedster. But what the old Century had, this 1954 fireball has lots more of.

You may remember that the last of the ante-bellum models had the old Buick rocker-head straight-eight. Horsepower was 165 at 3,800 r.p.m. This year's version comes with either a 195-horsepower overhead-valve V-8 and synchromesh transmission, or a 200-horsepower bomb, also a V-8, coupled to Dynaflow.

For this comeback, the Century borrowed its beefy engine from the Pullman-class Roadmaster and its democratic-sized body from that sassy scooter, the Special. Like the Special, its coachwork is three inches lower at the cowl than any of last year's Buicks.

Partly, this 5½-foot road-to-roof swagger, abetted by cut-out fenders and elbow-notched doors, is for styling with a sports-car twist. Partly, it's for low-slung stability, and this the Century, like any ultra-powerful car, needs.

The car leaves nothing to be desired in performance. Its Dynaflow torque converter is smooth; its big engine is quiet. And torque-tube drive combined with coils all around gives a gliding, heavy ride that is unmistakably Buick (PSM, Feb. '54, p. 146).

The acceleration figures I ran on the Century clearly point up its light-footed weight-to-power ratio (about 19 lb. per horsepower), among the lowest in the industry.

My averages (indicated speeds, with no allowance for speedometer error) for three runs in each category were:

0 to 40 m.p.h..... 6.6 sec.
0 to 60 m.p.h.....12.3 sec.
0 to 80 m.p.h.....18.6 sec.

Going from zero to 60 m.p.h., using Low Range only, I averaged 10.1 seconds.

My averages for Drive Range were:

40 to 60 m.p.h..... 6.3 sec.
40 to 80 m.p.h.....14.1 sec.
50 to 70 m.p.h..... 7.3 sec.

Speed to Spare

Unfortunately, a short stretch of the Speedway was littered with building equipment during my tests, and I was unable to run top-speed laps on the car. But I'm told the National Association of Stock Car Racing recently clocked it at 110 m.p.h. on Daytona Beach, Fla.

The Century's brakes grab like a hefty wife on poker night. Running at high speeds and snatching the car down in five consecutive fast stops, I didn't detect any brake fade until the fifth test. Then it was just a slight flattening out at about 15 m.p.h. after nosing down fast from more than 90.

On curves, this crossbred machine shows its good genealogy. In fact, it acts a little like a racing car, due mostly, I should imagine, to the big power plant in a lighter car.

At 95 m.p.h. it took our banked turns nicely except for a tendency to push the front end out from under me, just like a high-performance competition job. Here, in short, is another car that is going to have to be driven with discretion. Man-

ufacturers can build in comfort, safety and power, as Buick has in the Century, but they can't factory-install good judgment. The Century's power is for smart drivers.

My only objection to the Century's performance is its power steering. I feel it's too slow for a car this powerful.

General Motors likes to retain what has been called "natural feel" plus higher steering ratios in its hydraulic units. The trouble is that with enough horses to run a fire engine, this car is going to be driven faster than pre-power steering autos could go. At these speeds you need the most responsive steering possible.

Handy Brake, Heat Controls

The brake control, though not new this year, is still handy because you never have to go into a half-twist to operate it. A foot pedal for putting it on, linked to a hand knob at the bottom of the dash for releasing it, will save many a warped sacroiliac.

I like the heat and air controls for their simplicity. The three aircraft-type levers, working through notches in the Century's double-roll dash and plainly labeled, take care of everything. About all you have to remember is to push the two outside knobs down in summer, up in winter. END

In* Popular Science *next month Wilbur Shaw will report on Plymouth's new engine and fully automatic transmission.

EVERYTHING BUT THE KITCHEN SINK seems to be in here. If anybody comes up with a built-in drinking fountain or sandwich grill, auto makers will have to go back to long hoods.

FANCY DESIGNING was needed to get enough vertical trunk space into the shallower body. Buick came up with the same answer as Olds and Caddy: a high-hipped, square trunk lid.

FACTS ON '54 BUICK CENTURY

Model: Century (Series 60) four-door sedan.

Engine: OHV V-8; 200 hp. at 4,100 r.p.m.; compression ratio, 8.5:1; piston displacement, 322 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,331; bore and stroke, 4" by 3.2"; crankshaft bearing surface, 52.8 sq. in.; torque, 309 lb.-ft. at 2,400 r.p.m.

Weight: 3,805 lb.; per hp., 19.03.

Transmission: Dynaflow (torque converter) and 3-speed synchromesh (standard); rear-axle ratios, Dynaflow 3.4:1, synchromesh 3.9:1.

Steering ratio: 24:1 (power); 26.7:1 (manual); radius of turning circle, 20.8'.

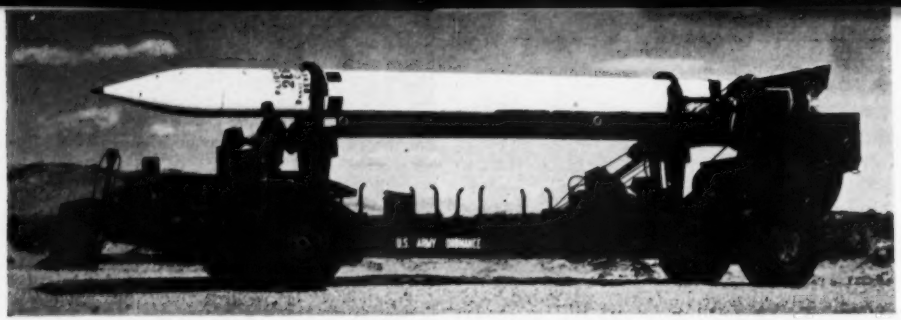
Effective brake-lining area: 207.5 sq. in.

Springs: coils all around.

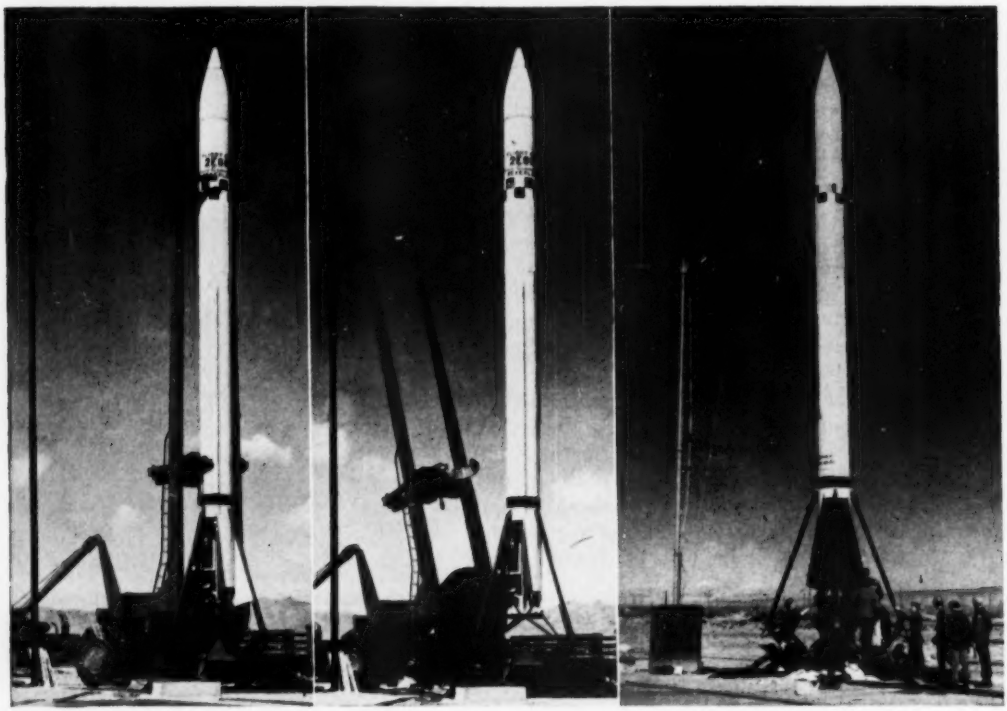
Outside dimensions: height, 60.5"; overall length with bumpers and guards, 206.3"; width, 76.6"; wheelbase, 122"; overhang, front 35.6", rear 48.7"; tread, front 59", rear 59".

Inside dimensions: seat-cushion width, front 62.5", rear 62.4"; leg room, front 42.3", rear 41.4"; headroom, front 35.6", rear 34"; seat height, front 12.8", rear 12"; vertical distance, steering wheel to seat cushion taken on arc, 5.5"; front-seat adjustment, horizontal 4.4", vertical 1.2".

Tire size: 7.60 by 15.



The Corporal's mobile launcher has mechanism at rear that raises it into take-off position.



With the Corporal elevated to firing position, the ground crew makes its final adjustments.

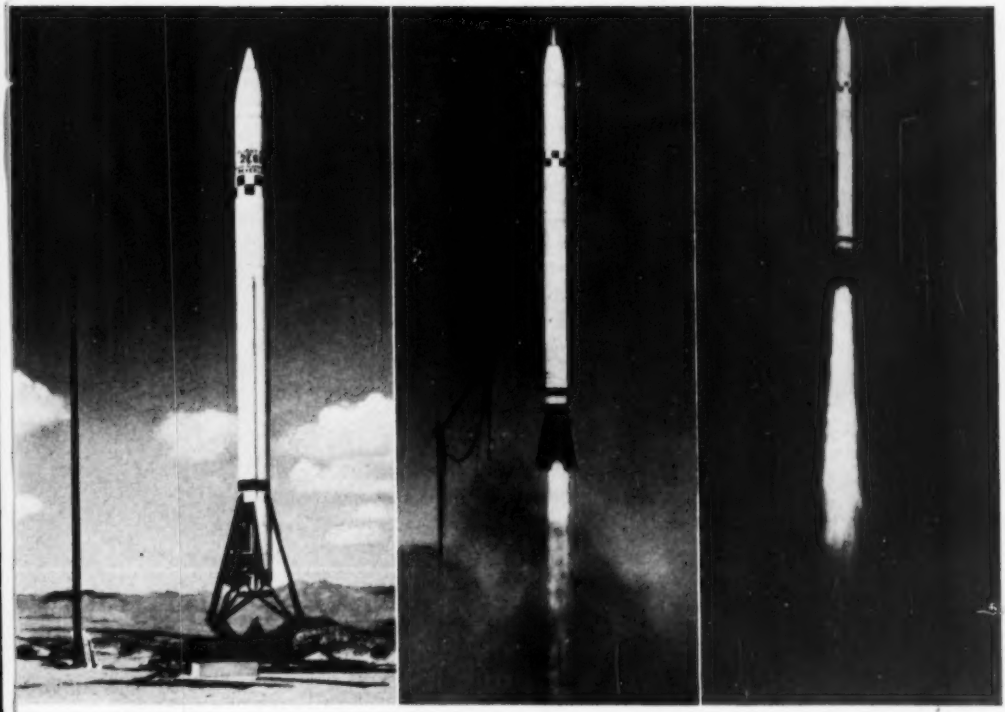
A GUIDED missile has joined our troops—and push-button warfare is one step closer. The new weapon can carry an atomic warhead. It is rocket-powered to hurtle through space at several times the speed of sound. With a far greater range than the new 280-mm. atomic cannon (about 20 miles) or the Honest John rocket shown on the next page, it will give field commanders a weapon with which to strike deep behind enemy lines.

Its name is the Corporal. Its job is to support ground-combat operations.

Since it is electronically controlled in flight, bad weather and poor visibility make no difference to the Corporal. If a target does not warrant an atomic blast, a conventional warhead can be used.

History of the Corporal goes back to 1944, when Army Ordnance asked Caltech to begin studies of a rocket-propelled artillery weapon. Out of this program came such test missiles as the Private, the Private First Class and the WAC Corporal.

New U. S. Atom Missile Outshoots Biggest Guns



Set for take-off, the crew is dispersed to safety. Fire rocket! Up it roars, spitting flames.

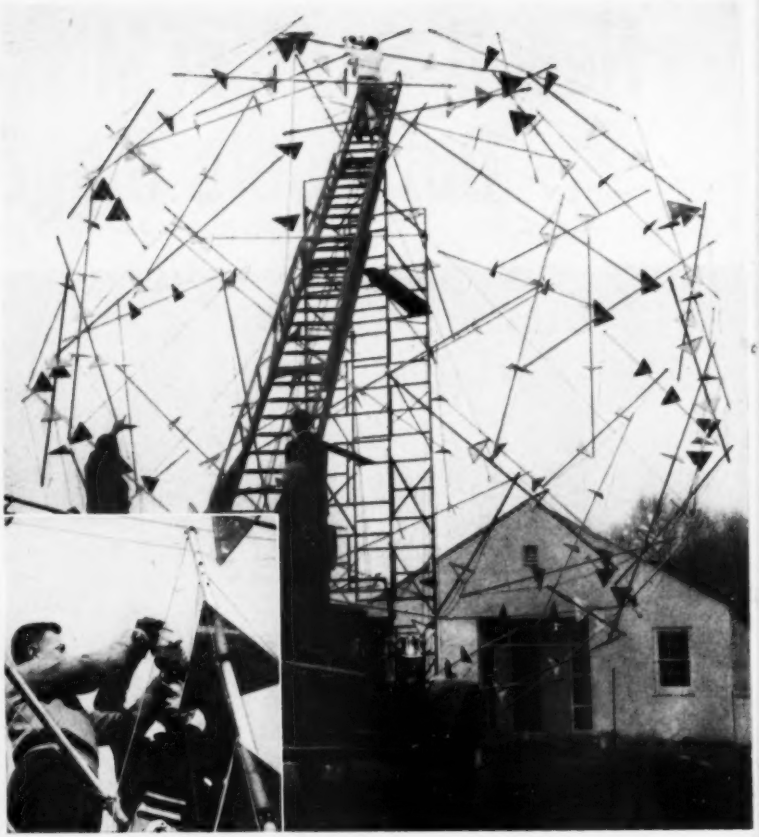
"Honest John" Can Rocket-Fire Atomic Ammunition, Too

ANOTHER addition to the arsenal of Army weapons is Honest John (right). It is rocket-powered like the Corporal, but is not electronically guided. A close-fire-support missile, it has the range of medium-to-long-range artillery. One of Honest John's high-explosive rounds (it can also carry an atomic warhead) packs the destruction of hundreds of artillery shells. It has a self-propelled launcher.

Wire and Math Make Big Globe Hold Together

PRINCETON architecture students call this weird globe a "discontinuous compression sphere." It is a 1:1,000,000 scale model of the earth, and is made of 90 aluminum pipes held together only by cable (see inset). No rigid part touches any other. Yes, it stayed up after the fire-truck ladder and scaffolding were removed.

The thing was planned by Buckminster Fuller, who has quite a reputation for unusual designs such as three-wheel cars, houses hung from poles, and big domes (like the Ford Rotunda in Dearborn, Mich.) that appear to be held up only by equations.



New Mercedes-Benz Is Designed for International Auto Races

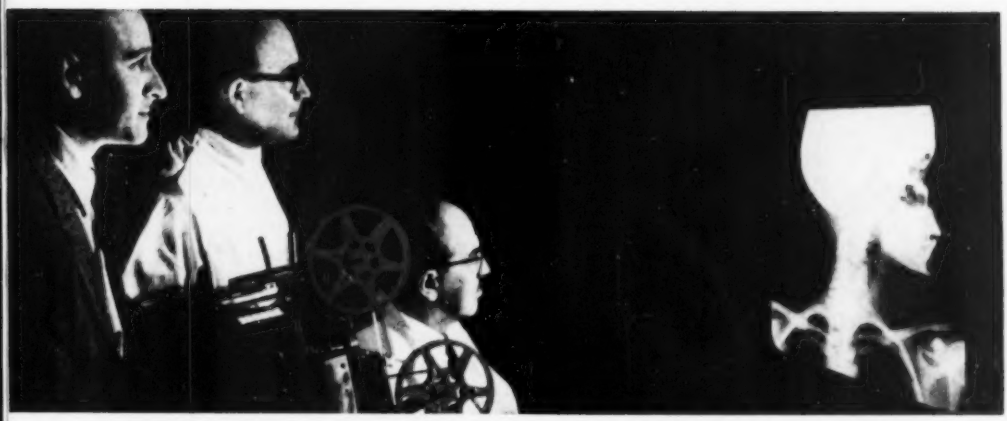
GERMANY'S Mercedes, which in one model or another has been providing tough competition around the world-wide auto-race circuit, will put a new speedster on the tracks this summer. The low, sleek job pictured above is officially called the Mercedes-Benz 2.5-liter formula racing car. Note the complete lack of a windshield.

Street Heater Warms Bus Stop

WAITING for an omnibus on a cold corner (right) isn't so bad in the English city of Newcastle. Overhead radiant heaters now shed warmth in a wide area to keep the travelers comfortable. The experimental gas heaters are expected to lure out more shoppers on chilly days, and may even be used to warm up sports fans at stadiums and outdoor workers at building sites and shipyards.

Jet Torch Cleans Up Castings

THIS jet torch puts the heat on castings to melt away excess metal. Its 6,000-degree flame can clean up work in less than half the time it takes with pneumatic chipping guns. The tool is in use at the Reading, Pa., foundry of the American Chain & Cable Co.



Doctors Study Internal Organs with Slow-Motion X-Ray Movies

REGULAR X-ray movies can be made to travel in slow-motion by a trick projector. A five-bladed shutter permits the machine to run very slowly without flickering, slowing down movement on the screen to one-third its actual speed. The University of Rochester, which devised the machine, uses it to study the action of internal organs.

New Jersey Shows

How to Fight

The giant skeeters that once drove vacationers away from this state's resorts are now on the losing end of a 42-year battle.

By Gardner Soule

FINE PARALLEL LINES running inland from New Jersey seashore are 10-to-20-inch-wide mosquito ditches, 150 feet apart. About 7,000 miles of these canals drain mosquito-breeding marshes and serve as water highways for minnows that eat mosquito larvae. Right: female Jersey skeeter.

THIS month, New Jersey is throwing men, equipment and chemicals into its forty-second annual battle against mosquitoes. Longer than any other state, Jersey has been warring against the pesky varmints. It has accumulated, in that time, probably the biggest bag of anti-skeeter weapons.

The ocean, for instance. New Jersey lets the tides into her seashore salt marshes, in some places, so that mosquito larvae will be washed away to sea.

And fish. From its bays off the Atlantic, and from its tidewater rivers, New Jersey invites into its salt marshes millions of killifish, a kind of minnow, to consume mosquito larvae.

If you flew south over the Jersey coast, from Sandy Hook, at the mouth of the New York harbor, to Cape May, at the bottommost tip of Jersey, you would see a shore striped with straight lines running inland. These are 10-to-20-inch-wide canals, dug to the marshes from the sea to (1) drain the marshes and (2) serve as highways for the killifish. Via the canals, the fish can reach 300,000 acres of tidal meadows from which great flights of mosquitoes could menace half of New Jersey.

Forty Miles—Looking for You

In the salt marshes, New Jersey and the killifish are after the notorious Jersey skeeter. This creature grows as long as ⅝ of an inch, breeds in salt water and can fly 40 miles in search of a blood meal (i.e., you). And he is only one of 48 different mosquitoes in the state.

The Jersey skeeter, they tell you in the state, used to bite golfers; golfers shout when they're annoyed; and this led to Governor Woodrow Wilson's signing

Mosquitoes

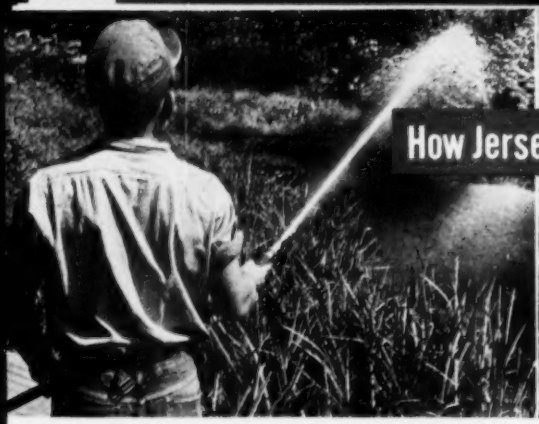
the first mosquito-control bill in 1912. The war was on.

One year later, Fred A. Reiley enlisted in the Jersey army. Today, after 41 years, he's still in the mosquito war—as superintendent of the Atlantic County Mosquito Control Commission.

I asked Mr. Reiley what was new at the front. "Mosquito-control men," he replied, "have more heavy, mechanized equipment this year than ever before.

"There are," he said, "two related reasons for this: cost and speed. Labor went up. And cost per foot of a canal, or ditch, dug by hand has gone up accordingly. Hence machines, fast and cheap, now cut or clean out the long stretches of canal."

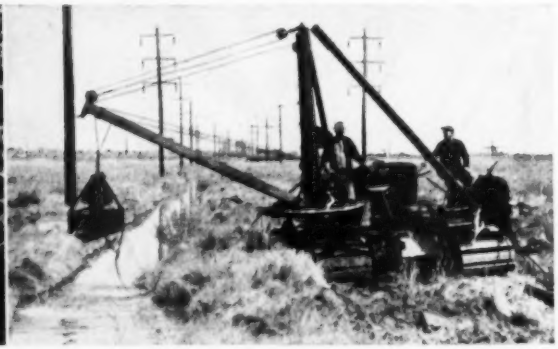
This year, Mr. Reiley's men are operating a big, tractor-like apparatus that will either dig ditches (75 feet a minute) or clean them. Designed by Mr. Reiley himself, it has long caterpillar treads to



How Jersey Does It

POND is power-sprayed with pyrethrum larvicide. This chemical, developed by Rutgers University, kills mosquito larvae but does not harm fish, waterfowl, animals or vegetation.

WEED CRUSHER flattens tall growth so that otherwise inaccessible ditches can be cleaned out and area sprayed. Crushing of weed stalks prevents new growth from starting.



PAPER CUP containing dead mosquitoes is removed from a trap by a New Jersey resident. Insects from about 100 such traps are sent to Rutgers for identification and study.

CLAMSHELL BUCKET on a crane is used to recut and keep open the widest mosquito-control ditches. The ditches must be kept open for drainage, especially in flooded areas.

keep it from sinking into the marshes.

The machine is a far cry, Mr. Reiley recalled, from the tools he started with in 1913: spades. But the crew of today's Gargantuan ditch-digger-and-cleaner is exactly the same as the crew of a spade of 41 years ago: one man.

Modern Weapons for Mosquito War

New Jersey knows you can't solve a state's mosquito problem unless you have mosquito-control men in most counties, and it has them. It also has an impressive array of machinery ready to roll against the enemy:

Weed cutters. These are tractors with mowers in front that look like giant hedge trimmers.

Weed crushers. You can take an old Ford, put on wide rims and a caterpillar tread, and come up with this kind of a machine. In some sections of Jersey, you can't get into the meadows or marshes, or up to the ditches to clean them out, till the weeds are flattened.

Power sprayers for catch basins—those sewer openings at city street corners. These breed mosquitoes like fury. A new device is a right-hand-drive truck to carry the spray. The driver can spray without leaving his seat.

The scavel. This is a double moldboard plow, shaped like the inside of a ditch. With a tractor pushing, it can clean ditches at a rate of 125 feet a minute.

Trucks equipped with fogging apparatus. This lays a mosquito-killing mist

over part of a town, a home, a church, a picnic ground or a camp site, keeping down mosquitoes for up to 10 days.

Airplanes. Old, 90-mile-an-hour biplanes spread DDT and No. 2 fuel oil over the countryside. "We don't like speed when spraying," Mr. Reiley explains. "If a plane travels too fast, it's hard to control the spray."

Helicopters. The flying windmills can hover over and spray ponds, meadows or marshes surrounded by factories, high-tension wires and other obstacles.

Knapsack sprays. There are forests and marshlands that cannot be reached by heavy equipment. Jeeps, motorcycles, or feet carry back-pack mosquito men into such places.

"*Hand grenades.*" When the mosquito fighters are in undergrowth that catches on knapsack equipment, they fall back on a "hand grenade." This is the "tossit," a kind of pellet that dissolves when thrown into water and shoots out DDT and oil. These substances float to the surface and kill mosquito larvae.

Dredges to widen and deepen river channels, thus providing drainage for mosquito-breeding areas back inshore. The dredges also fill in marshland, thereby eliminating mosquito-breeding spots.

Motorboats equipped with power sprays to squirt pyrethrum larvicide, a chemical that destroys mosquito larvae.

Pyrethrum larvicide was developed by the Agricultural Experiment Station at Rutgers University, New Brunswick, N. J., to kill mosquitoes without harm to other life.

Rutgers discovered, among other things, that the Jersey skeeter could fly 40 miles. I talked with Dr. Bailey B. Pepper and Daniel M. Jobbins at Rutgers and from them I got this picture of the mosquito tribe:

The mosquito is well adjusted to life on this earth. In millions of years, it has undergone almost no evolutionary changes, a fact demonstrated by fossils found in amber in the Baltic Sea region. The skeeter was, and is, one tough baby.

It will be the female that bites you. It always is. She needs protein to mature

MOSQUITO CONTROL begins at home. This drawing shows some breeding places that can be eliminated. Where you must have standing water, change it at least twice a week.

her eggs; this means blood, and she will travel a long way to get it. Or she will fight to get it—if she is a house mosquito, she will put her head and leg into a screen and try to wriggle through. She may be a night-biter or a day-biter. She may give an alarm: a hum made by the beating of her wings. Or she may be absolutely silent.

She can live anywhere you can, does live in all 48 states. She gets blood from all domestic and many wild animals: from chickens, which she bites around the beak or on the legs; from snakes, which she bites around the head; from turtles, which she bites under the legs; and from humans.

She finds you infallibly. Science does not know exactly how, but does know that it has to do with following the trail of water vapor and carbon dioxide that you breathe or perspire out of your body. That trail is enough for the female to know wherever there is an active life process going on, and a blood meal to be had.

MOSQUITO REPELLENT is tested by a laboratory worker. Only his left arm has been treated. Note the mass of greedy mosquitoes, out for a quick bite, attacking untreated arm.

Male Mosquitoes Can't Bite

While the female is out for blood, the male lives on the nectar of flowers. He can't bite you; his proboscis, or beak, is not strong enough. But the female is trouble enough. To your dog, she can bring a fatal heart-worm disease; to your chickens, fowl pox; to you, stings and itches, malaria or encephalitis (which broke out in California in 1952).

There is one recruit the army of mosquito men would especially like to enroll: you. Both Dr. Pepper and Mr. Jobbins were definite. "Mosquitoes from one pail in your yard," says Dr. Pepper, "can annoy the whole neighborhood."

Against mosquitoes live and coming at you, four steps are recommended: Spray indoors with DDT or other fly sprays. Be sure that your screens have 16 meshes to the inch (the standard U. S. screen). Check to see that your screens fit tightly. And use repellents on exposed parts of your body when you go outdoors.

The Good Old Days—for Skeeters

Have the methods used in New Jersey really worked? When the mosquito men first got busy, 42 years ago, the standard summer attire of a man outdoors included a broad-brimmed straw hat with mosquito netting from the top of the hat down to around the neck. Fishermen wore boots or newspapers around their legs as partial armor. People slept under mosquito nets at night. Some hotels closed because hordes of mosquitoes chased away guests. There were countless cases of malaria.

"I have seen mosquitoes so thick right here in Atlantic City," said Mr. Reiley, "that 500 feet away you couldn't tell Tom from Dick. You could see the form, but that was all."

Today all this is ended. There is no malaria except imported, spotted in a few returning servicemen. The mosquito-control men have made habitable large areas of Jersey that formerly were plagued with the pests.

They have followed the paths pioneered by Walter Reed and W. C. Gorgas, who freed Havana and the Panama Canal Zone from yellow fever and malaria by conquering the mosquitoes.

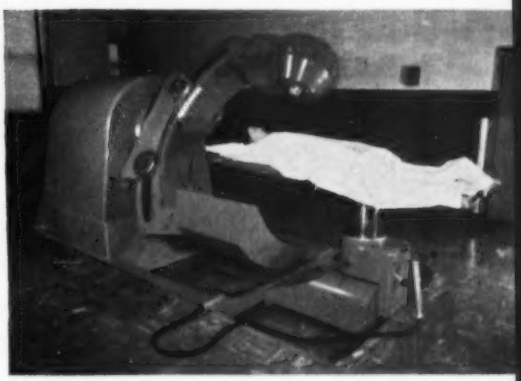
If you stop to think, you will, I believe, be able to picture some definite evidence of the success of the Jersey skeeter killers. You've seen photographs of bathing girls at Atlantic City during the mosquito season. They show quite clearly that the girls on New Jersey beaches no longer find it necessary to cover up against mosquitoes. END

Aluminum armor and a sword made of plastic equip modern Galahads to battle spacemen. Knight's gear, imported from Italy by the J. J. Sales Corp., 1123 Broadway, NYC, can be substituted for an old sauce-pan helmet and a stick disguised as a sword.

Tailor-Made to follow the pilot's body contours, this pressurized outfit is worn by test pilots flying Northrop Scorpions. It prevents their blacking out from thin air or from sharp turns.

Thickest Douglas Fir ever felled by man is this giant, 12¾ feet in diameter. It took three men with a power saw a day and a half to cut it down. The annual rings on the fir tree revealed that it stood 586 years before it heard the loggers yell, "Timber!"

Cancer Trap: One steel jaw below holds a slug of radioactive cobalt. The other is a counterweight. They spin around to avoid burning normal tissues near a cancer during treatment at Francis Delafield Hospital, New York.



For speeds of 1,500 to 3,500 m.p.h. a ramjet engine does its best job. Blue tube shows

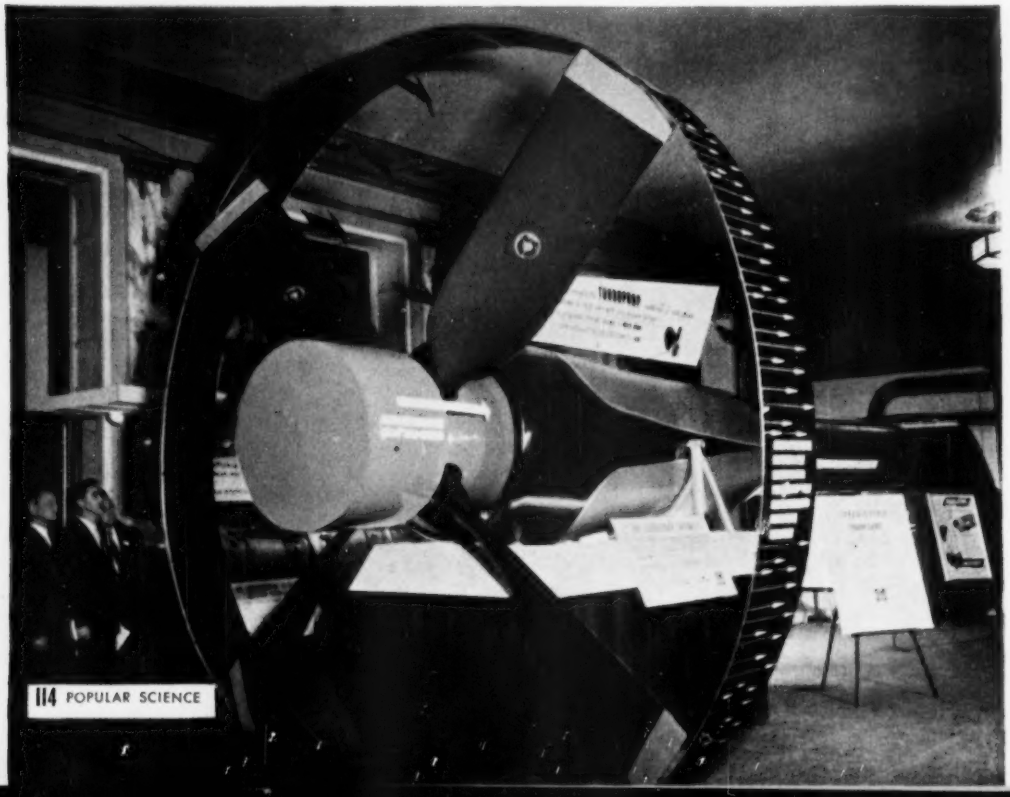
At 3,500 m.p.h. a rocket engine is just beginning to pick up speed. Combining its own

Engines You'll Still See in 1964

THE engines that Curtiss-Wright engineers expect to write the next 10 years of aviation history were exhibited recently in New York. Blue tubes were attached to them to show how much air they consume per 1/100 of a second, and red tubes to show the thrust they produce. These pictures, taken specially for POPULAR SCIENCE MONTHLY, show you how greatly the engines designed for very fast flight differ from those that are more efficient at slower speeds.

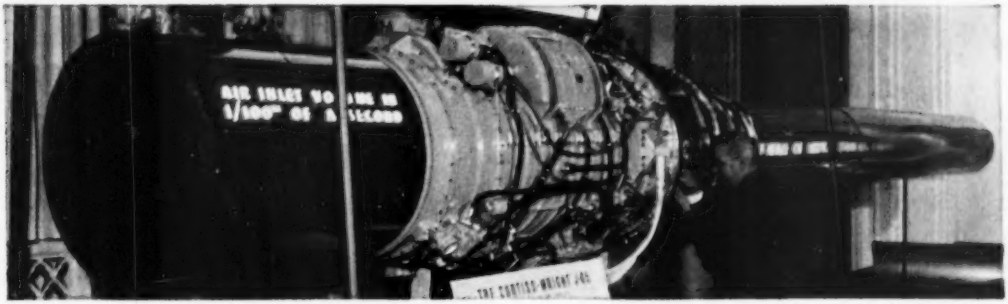
You may have ridden already in a commercial airliner powered by the turbo compound. Whereas the rocket above uses half a pint of fuel and oxidizer in 1/100 of a second, the bigger turbo compound uses less than half an ounce!

TURBOPROP is for long, nonstop transport flights at 500 to 800 m.p.h.; four-fifths of power in exhaust is used to help drive the propeller; the rest contributes to engine's output through jet reaction. Red tube shows importance of the fifth devoted to thrust.



amount of air that it gulps in 1/100 second; red tube at rear represents the thrust produced.

oxygen supply with fuel, it kicks out a 66-foot column of thrust (red tube) in 1/100 second.

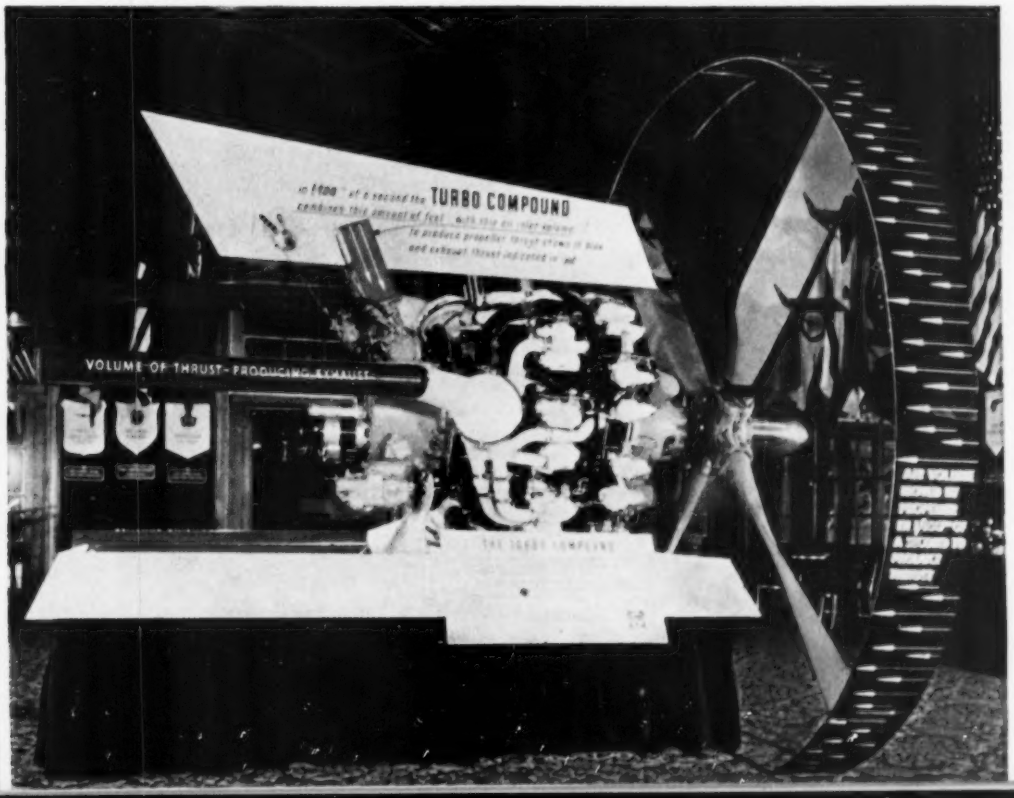


TURBOJET, used in military planes now, is most efficient when it's going from 800 to 1,500 m.p.h. and flying at high altitudes.

TURBO COMPOUND, used now on DC-7's and Super Constellations, is more efficient than turbojet or turboprop below the sonic barrier.

When turbojet planes fly more slowly at low altitudes, they are not as efficient as the propellered engines pictured below.

It is expected to raise transport plane speeds above 400 m.p.h. Turbines recover energy in exhaust, apply it to the prop. END



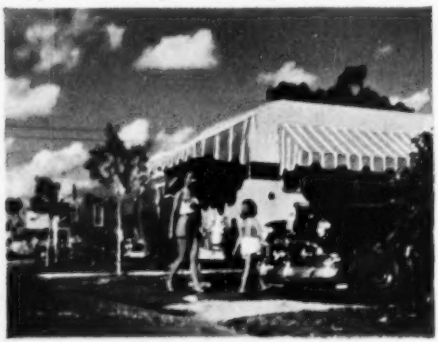
A caravan of new trailers heads west.

Look What's

Push back that sliding panel in the ceiling and light floods in through a plastic bubble.

All the comforts of home are right at hand.

A typical trailer park has a permanent look



Happened to Trailers

They have settled down to the soft life, as the majority of the 1,700,000 Americans who live in them give up vagabonding.

By Kenneth Wylie

TRAILERING has changed. The bare, utilitarian shelters on wheels once favored by vacationers, and campers and other outdoors people, are largely things of the past.

Today's trailers are big and fancy, and a lot of them—a good 50 percent—are not being pulled any more by Pa at the wheel of the family car. When they are pulled at all, which is rarely, they are pulled by trucks, specially sawed off for the job. Quite a few of the nation's 740,000 trailers are just sitting in parks now, many of them up on blocks, their wheels either in storage or sent back to the manufacturer on a trade-in. There is a campaign under way to call these trailers "mobile homes."

Trailerites have become sluggish. A recent survey showed that the typical coach is moved only once a year. The average move is 200 miles.

In 1937, when trailer sales came to $17,000,000, vacationers paid out a total of $8,500,000 for their share.

In 1953, when trailer sales swelled to $330,000,000, vacationers bought only $2,000,000 worth. Their slice of the total had slumped from 50 percent to less than one percent.

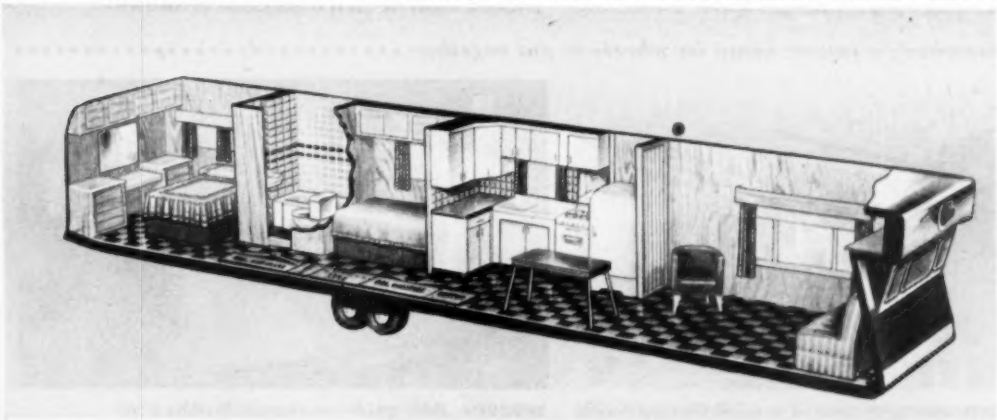
Inside a Mobile Five-Room Home

Today, between 80 and 90 percent of the country's 1,700,000 or more trailerites list their mobile homes as permanent addresses.

And what homes they are! Typical models have all-metal skin and five rooms within. Living quarters include two closed bedrooms, with closets; dinette; kitchen, with standard-size gas range, electric refrigerator and two-basin sink; large living room; and bathroom, with toilet, washbowl, tub and shower. The plumbing is usually triple-trapped.

Space, naturally, is the No. 1 problem

This 45-foot, two-bedroom mobile home has four closets, an all-metal kitchen, 18 windows.



in trailer design. Builders have sidled around this in varying ways.

One coach has a main, transverse partition fitted on rollers in tracks. When it is getting late and you want to shut Uncle Ev off in the corner with his cigars and magazines so that you can go to bed, just nudge the wall—and presto, he's boxed in.

Push-Button Room

Another model has a retractable alcove section, which pops out to one side for added space once you are off the road and anchored in a park. When you are ready to move on you pull it back in and your trailer is its old, slim self again.

Quite a few mobile homes have camel-like humps topside that house second-story bedrooms. These are sometimes reached by stairs, sometimes by ladders.

As in orthodox cities, there are skyscrapers in trailer-town housing. One huge model has telescoping walls, made of metal clapboard and fitted with shutters. Electric motors and hydraulic pumps lift the outer walls up to second-story height, and a little housework inside lays out floor and ceiling. The result is a Georgian Colonial, two-story house, with stairs up the outside to the upper floor.

The giant of them all is a 65-foot, articulated tractor trailer (PSM, Feb. '53, p. 166), priced at just $75,000. For this you get, among a host of superlatives, a combination sun deck and helicopter-landing platform, portable swimming pool, wine cellar and three elephant guns.

The giant, two-story trailers with all the gimcracks are, of course, exceptions. But the completeness of the equipment of standard trailers is their biggest appeal. Manufacturers claim that this feature sells many buyers on a mobile home in place of a dull, ordinary house on a foundation.

Heating and ventilating long were bugaboos to both trailer makers and owners. New heaters and closet-enclosed trailer furnaces have changed all this. Fired by oil or the same propane or butane used in trailer stoves and refrigerators, they send out enough hot air through ducts to warm the coldest feet. Forced-air fans speed up the warming process or, during mild weather, bring in cool night air through wall or roof vents. In hot weather, a trailer air conditioner will cool the place off in no time, and keep it dry, too.

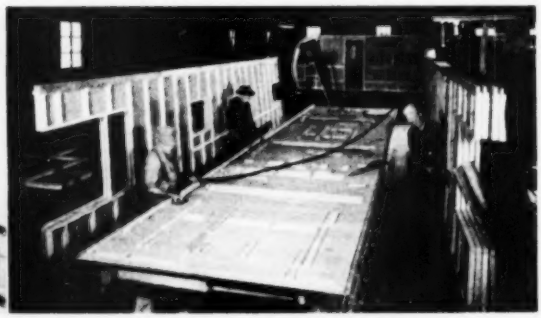
Steel Trusses for That "Dachshund" Sag

Highway regulations hem in trailer height and width to 14 by eight feet in most states, though Arizona, Connecticut and Rhode Island let them spread to eight and half feet. To expand, trailers have had to grow dachshund-style—longer and longer. This has involved, as the little German dogs know so well, problems of sag and creak.

Trailer frames, accordingly, are steel trusses. Most of their load stress is thrown

Somebody's future home on wheels is put together

STEEL UNDERPINNING of a wood-framed coach is hoisted to a second-floor production line.



WOODEN JIGS guide workmen building its sides. Finished walls stand around the shop.

Done with roaming, the owners of this trailer have added a carport, porch, landscaping.

at points above wheels and suspension points. To prevent sag, they may either be preloaded or built with as much as three inches reverse camber. When the sides, also load-bearing trusses, are built on, the frame flattens out.

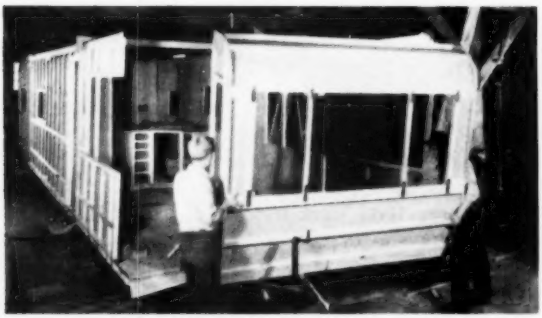
Manufacturers Play No Favorites

Nailed-wood, steel or aluminum frames are most common for trailer bodies. Trailer skins have been made out of just about everything that can be cut into panels and hung on a frame. Even canvas, stretched taut as a drumhead over frame beams, has had its play. Aluminum, sheet steel, composition board and insulating board have proved to be about the best.

Probably the first vehicle approaching today's trailer was a house car built in 1920. Sixteen feet from front to back, it had a double bed over the hood, another at the rear, and cooking and eating areas between.

Today, 75 percent of all new trailers are in the 30-foot class or longer. Most stretch between 16 feet and 40, with a few running to 45 or 48 feet. Longer models are custom-built.

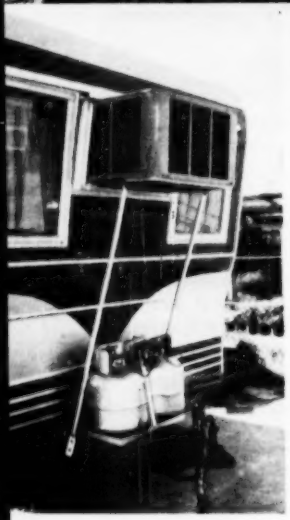
The standard price spread is from about $1,600 to $5,000. If you like, of course, you can knock out the eyes of



SIDES AND ENDS are nailed together. Cabinets will be fastened down when the roof goes on.

LOTS OF INSULATION and moistureproof paper are put in walls. Roofs are often aluminum.

FIREPLACES, fitted with gas logs, lend special charm to the most lavish trailers. Some also have big refrigerators, freezer cabinets and even barbecue pits.



AIR CONDITIONERS are almost a must down South. They are usually bolted outside a window, roof-mounted, or housed in cabinets that match the furniture.

SWIMMING POOLS are not common in trailer parks, but they bring a touch of swank to some out West, where the pool has special social significance.

the rest of the trailer park with a palatial model, starting at $14,000.

What the mobile-homes industry now refers to as a "travel trailer," and what you may still simply call a trailer, is purchased today largely by the younger and hardier folks.

While the mobile-home dweller, jaded with his easy life in a movable apartment, might find traveling in one of these 12- to 22-foot coaches a Spartan life, the new ones are just as ruggedly and nicely made as his big model. They do lack the wall-to-wall carpeting, flush toilets and garbage grinders that come with the luxury sizes. But they have stoves, refrigerators, heaters, beds, washbowls or sinks, and sometimes baths.

Small Jobs Mean Easier Pulling

Don't forget that when you give up the special delights of the over-30-footers, you are getting rid of pounds, too. A 12-foot trailer weighs in at about 1,400 pounds; 22-foot models run about 3,400 pounds. That adds up to lots easier pulling

For the most part, you use community bathhouses and laundries when traveling in one of the smaller trailers. There are plenty of these facilities in the national parks and some in state parks, too.

When you get in the fancy, over-22-foot bracket, though, it's the trailer parks for you. They charge anywhere from about $12 to $40 a month, with the average rental between $15 and $25. Transients get by for $1 a night in most places, and there are reduced rates for servicemen in many parks.

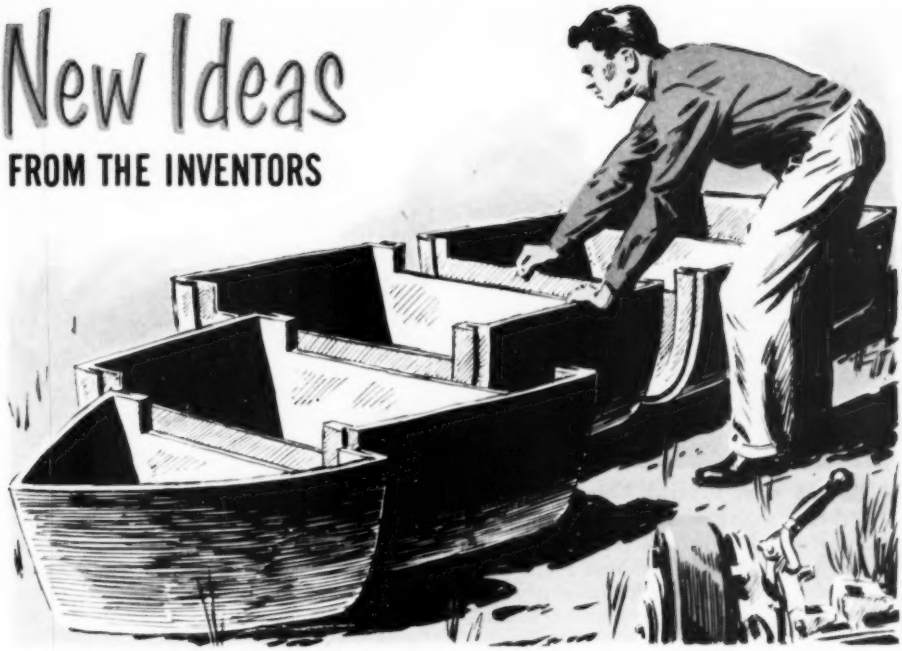
For your money, you get such things as cement patios beside each trailer lot, street signs and street lamps, playgrounds for the children, TV lounges for the whole family, recreation areas for grownups, and regular deliveries of bottled gas, baked goods, milk and maybe brushes, too. Mail service of some kind is always available.

Each trailer connects to the park's water, sewage and power lines. Garbage is picked up regularly. Some parks have

[Continued on page 250]

New Ideas

FROM THE INVENTORS



1 Sectional Boat Easy to Store. You could haul or store a boat more easily if it came apart like this one. Disassembled, these sections would nest one within another. Flanges on the ends of the units would interlock, and the paired partitions at each joint would support a seat. The assembled boat would have a smooth outer contour. If you wanted a smaller, faster craft, you could leave off one or two sections.

2 Shoe Scraper to Open with Door. A driver could avoid tracking sand, mud or snow into a car that had a convenient foot scraper concealed behind the door apron. This one would slide under the car floor and pull out each time the door was opened. Adjustable brackets would adapt the scraper to fit different makes of cars.

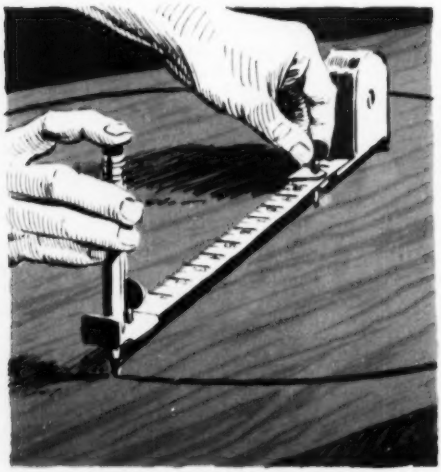
3 Pipe to Clean Itself. Some of the messiness of pipe cleaning might be eliminated by a plunger that would eject ash and soggy tobacco heel. The rim of this one would be shielded to block passage of tobacco juice and shreds into the spring and pivot mechanism. The lever that retracts the plunger would fold into a slot.

Please turn the page for more new ideas.

MORE New Ideas from the Inventors

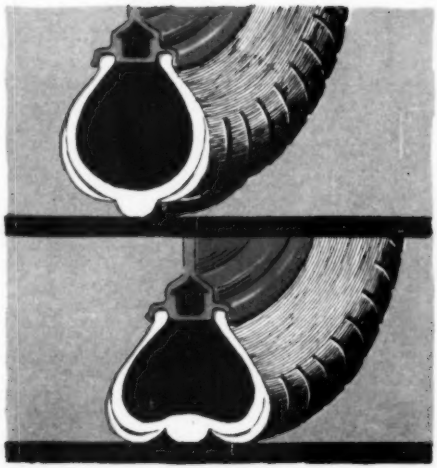
4 Gun to Cast Fishing Line. Triggering a rubber spring would shoot the hook on this line out to midstream. The gunlike rod would help a novice fisherman get a good cast; experienced anglers could use it where crowding or foliage might make it difficult to throw a hook. Springs of varying power would control casting distance.

5 Angled Brush to Paint Sash. Clipped over an ordinary paintbrush, this metal hood would shorten and reshape the exposed bristles. Each stroke of the bunched bristles would lay more paint on narrow surfaces such as trim and window sash, and the outer bristles would be less likely to spread, splatter or overrun a line.

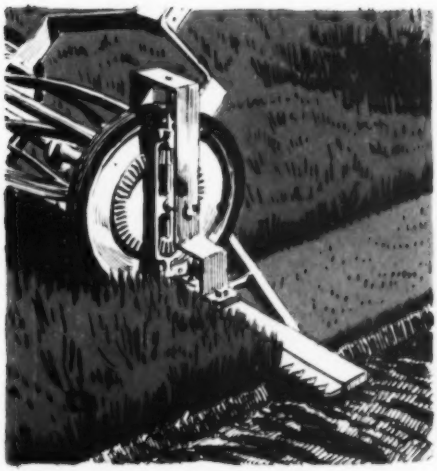


6 Rule Attachment to Draw Circles. By converting any steel tape or folding ruler into a compass, this attachment would simplify accurate drawing of large-radius circles or curves. A pivot or center clip that would be movable along the ruler's edge could be indexed at any desired radius. A clamp at tip would hold pencil or scriber.

7 Signal to Warn of Speeding. If you find that it takes too much concentration to keep within changing speed limits, you'd probably welcome this gadget. You would simply set the dial for the limit you wanted to observe. Any time you went over it, a light or buzzer would remind you to let up on the pedal.



8 Tire to Adjust to Road. Fully inflated, this tire would ride mainly on a heavy-duty center ridge. When slick surfaces demanded more traction, the driver would let air out to put extra tread in contact with the road. The inventor proposes to make the center bead replaceable so normally worn tires could be easily renewed.



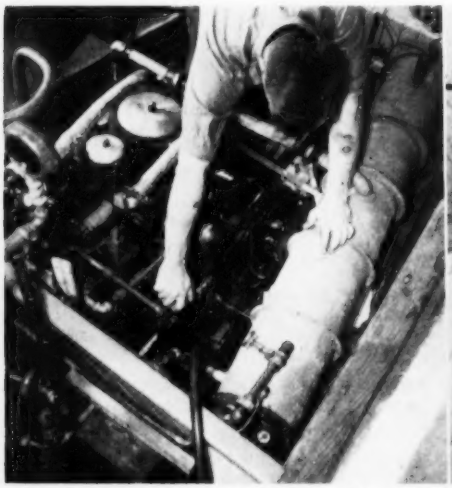
9 Mower Shears to Clip Edges. A pair of shearing blades jutting from the side of a standard lawn mower could reach under hedges and trim up close to curbs and flower beds. A gear and yoke would be bolted to the wheel, and the outboard portion hooked on as needed. Wheel motion would drive the reciprocating saw-toothed blades.

10 Bomb to Blow Out Fires. This fire-fighting bomb would have a warlike explosive head, but its fragile body would hold a quantity of fire-extinguishing chemical. Detonation of the head would create a partial vacuum over a wide area, and this would be quickly filled by a blanketing mist of the chemical. Wider dispersal of the fire-fighting agent, says the inventor, would make this bomb more effective than conventional extinguishers for smothering forest fires, oil fires and similar large-scale blazes.

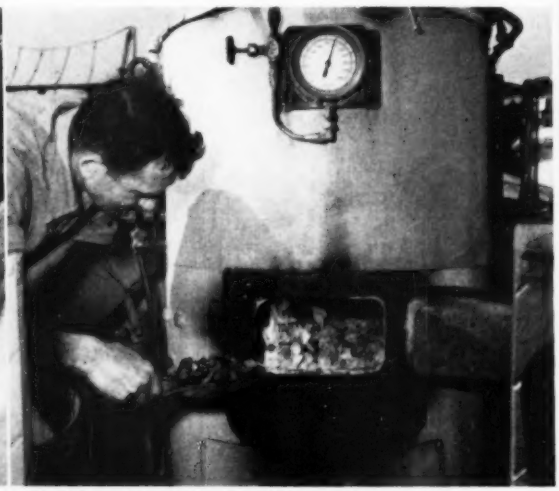
U. S. patents on these inventions have been granted to: 1. B. Sammer, Evanston, Ill.; 2. C. Scherzer, Goodland, Kan.; 3. L. Di Federico and N. Di Lorenzo, Southbridge, Mass.; 4. J. Fisher, Medford, Wis.; 5. R. Perkins, Niles, Ohio; 6. A. Goodford, Wilkes-Barre, Pa.; 7. G. Tod, Schenectady, N.Y.; 8. J. Langdon, Long Beach, Calif.; 9. A. Drohomer, Santa Ana, Calif.; 10. L. Talbot, Livermore, Calif.

LITTLE EFFIE GETS UNDER WAY, heading past the prow of the Academy's training ship, *American Mariner.* The 26-foot steam whaleboat displaces three tons. It averages six knots.

When classes are over, Merchant Marine Academy instructors play at what they teach in a homemade miniature steamship.



A FOUR-FOOT CONDENSER (under the engineer's left hand), nine inches in diameter, takes discharged steam from the boiler, cools it with sea water and returns it as feed water.



POURING ON THE COAL with a scoop, a crewman fires up the boiler. It has a draft gauge and two whistles—one chimes and the other peeps like a French locomotive.

Steamed-Up Whaleboat Pretends It's a Ship

THE CAPTAIN calls the boiler room by sound-powered, merchant-ship phone. Cmdr. L. S. McCready, USMS, who owns *Little Effie*, is at the tiller —oops, we mean "on the bridge."

FROM May to October, a taut but hybrid craft called *Little Effie* can be seen and heard nearly every day puffing about the Sound waters off northwestern Long Island. She is perhaps the only steam-powered whaleboat afloat. Her exhaustively elaborate steam plant is like a Liberty ship's in miniature.

Her master is Commander Lauren McCready, head of the department of engineering at the U.S. Merchant Marine Academy, Kings Point, N. Y. (PSM, May, p. 142). He found her on her uppers, brought her home to the Academy, lovingly restored her oak-framed, copper-fastened hull, equipped her with a home-made boiler and engine, and named her for his mother. Commander McCready and faculty friends are shown here on a typical voyage, earnestly at play. END

PUMPING OUT THE BILGE is one of the jobs of a one-cylinder, double-acting auxiliary steam engine. The engine also injects feed water into the boiler, runs its forced-draft blower.

DRIVING ENGINE is this three-cylinder, triple-expansion, double-acting job, which develops 15 to 20 horsepower at 400 r.p.m. There is a pressure gauge on each cylinder receiver.

Motor Chair Climbs Up and Down Curbs

THIS wheel chair steps up and down curbs in low, scoots down the road at 10 to 15 m.p.h. in high, and can travel in sand and snow. It runs on a two-cylinder engine complete with self-starter.

A paraplegic, M. Arnold Lerman, 310 East 34th St., NYC, worked out the Curb Stepper so that he could get about the city without any help along the way. He hopes to market the motorized chair for about $400.

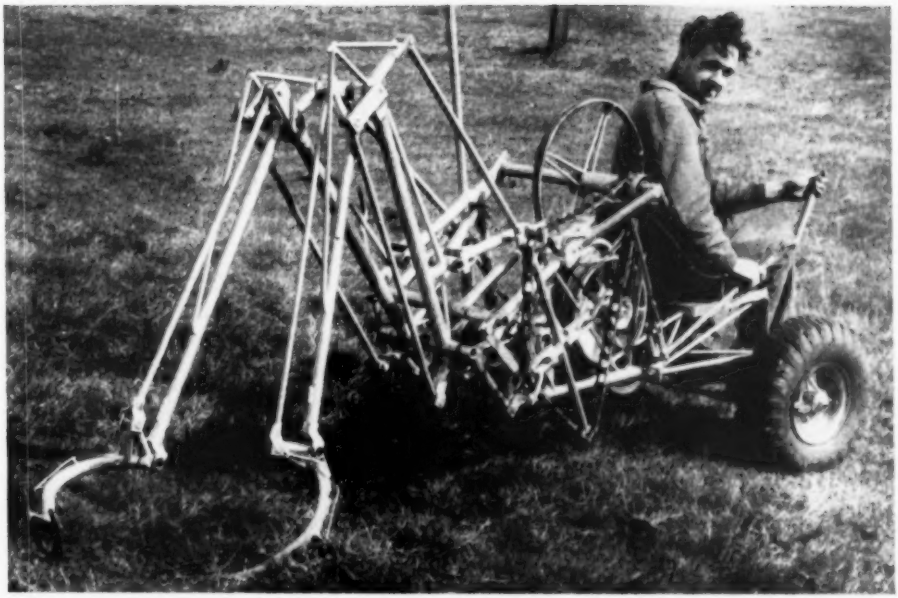
▶▶▶The busy bee is busier than ever now. A new breed of honeybee developed at the University of California is said to gather up to 15 times as much pollen in his lifetime as his slower kin. Farmers who keep bees to improve the pollination of their crops will need fewer hives.

Picture Book Takes a Tubbing

THIS picture book, of water-resistant plastic, goes right into the tub with the junior artists when they finish their painting session. Both kids and coloring book, the latter made in West Germany, wash off for more art work on another day.

Paint Pens Seal Color Inside

WITH these fountain brushes, your youngster won't make a mess mixing and splashing water colors. Fill each handle with water, and a food-dye tablet inside dissolves to provide hours of daubing. Kenner Products, 912 Sycamore St., Cincinnati, makes the kit.

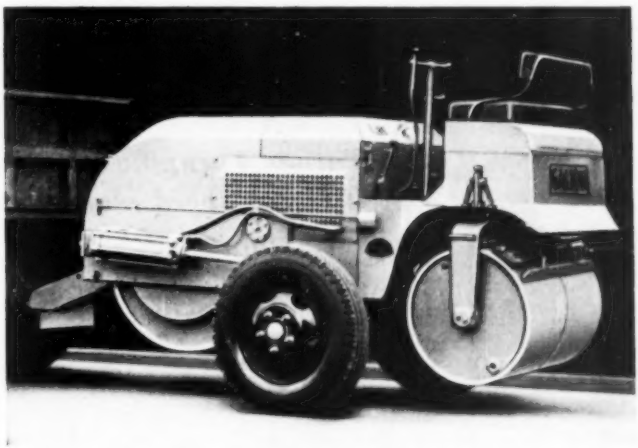


This Walking Tractor Wears Horseshoes to Conquer the Mud

"WALKING" on bow legs, this odd tractor ambles over the fields shod with horseshoes. Douglas Lattimore, the English farmer who built it, says it can navigate in deep mud, planting each leg firmly before taking the next step. A handle controls the length of its stride and a lever steers the two front wheels over which the driver perches.

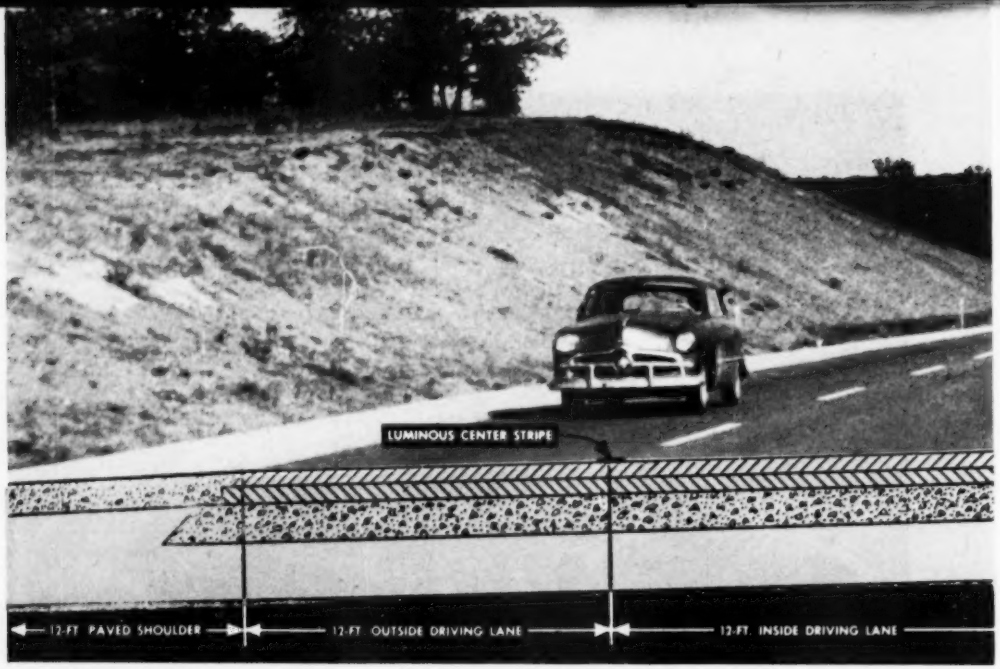
Pressing Iron Also Brews Tea

TURN this new German iron upside down, set the heat switch for a high temperature and you have a convenient hot plate for cooking. There is a built-in rest for holding the iron steady. It is manufactured by AEG, Berlin-Grunewald.



Retractable Wheels Speed Roller Over Highway

TOWING the roller above from job to job is faster because it rides on rubber-tired wheels. An engine-driven hydraulic jack, built into the truck hitch, raises the forward roll and lowers the wheels. The steering roll goes up as the wheels come down. Galion Iron Works, Galion, Ohio, makes it.



Center hump helps keep cars from crossing to opposite lane of Oklahoma's new turnpike.

The Sooners' Speedway Is a Safeway, Too

The Turner Turnpike's accident record shows that it is not speed alone that kills motorists.

By Gilbert Hill

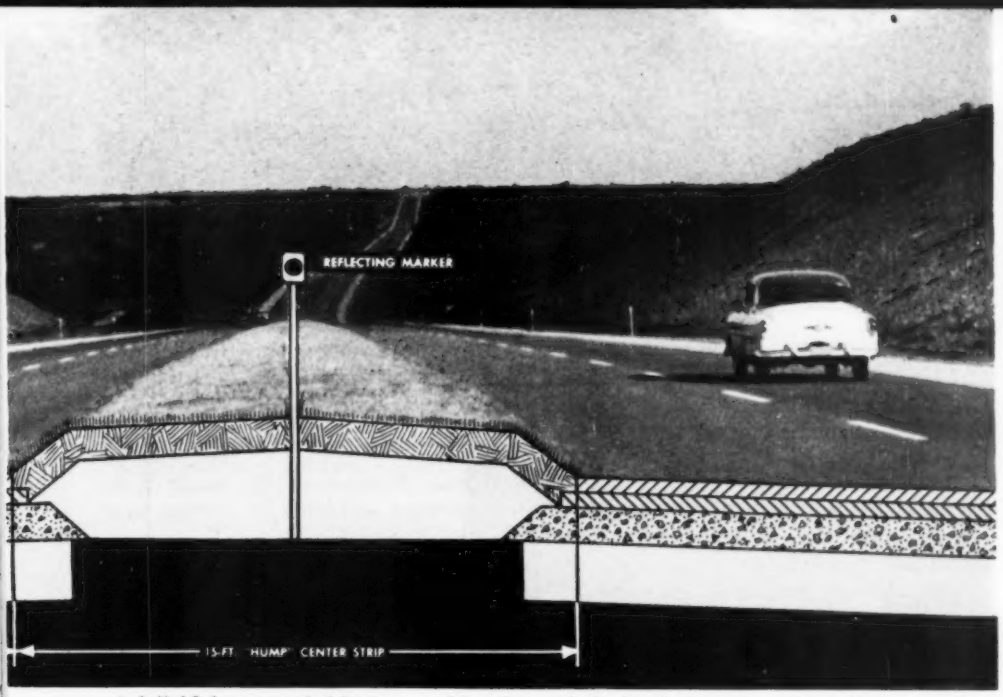
IF YOU can't drive 88 miles in 88 minutes—and have time to stop for a cup of coffee on the way—you're a sissy.

That's what they say in Oklahoma about the Turner Turnpike between Oklahoma City and Tulsa. Yet this new road is being watched by safety experts and highway engineers throughout the country. They hope that the 88-mile, four-lane strip will teach them lessons they can pass on to the nation's 47 other states.

The turnpike is only 14 miles shorter than U.S. 66, which connects the same cities. There wouldn't be much point to it if it were not engineered for speed. But it is.

The Turner Turnpike has few rivals in this department, with a *minimum* of 40 miles an hour and a top of 70. On its smooth asphalt a driver can save an hour's time over slow, narrow U.S. 66.

As to safety, the road has an enviable



A full 12-foot graveled lane runs along the road flanks, for emergency repairs or napping.

record since it opened in May, 1953, of only four persons killed. One woman lost control of her car when a house trailer she was pulling began to weave. The other three fatalities apparently resulted from drivers going to sleep at the wheel.

Speed itself does not appear to have been a major factor in accidents on the Oklahoma turnpike. It's the combination of high speed, whistling wind, singing tires and easy driving—with no worry about anyone leaping into you head-on—that seems to be a Lullaby of Death. The driver apparently goes to sleep. He is killed.

In fact, some highway patrolmen are wondering if just enough extra speed to make the driver feel a little uneasy might not in itself be a safety factor. At least it would tend to keep him awake at the wheel.

Fortunately, most drivers *do* keep their eyes open while driving, and for them the Turner Turnpike has a novel safety gimmick—the "hump"—which is likely to affect the construction of multiple-lane highways for years to come. This hump is a 15-foot-wide, foot-high earthen center, or median strip, separating opposing lanes of traffic. It is easy and inexpensive to construct.

The idea isn't new. The Pennsylvania Turnpike started with a 12-foot-wide de-

WELCOME AND WARNING CARDS are handed out to drivers as they enter these toll gates.

This is Oklahoma City end. The highway was named for former governor Roy J. Turner.

GLASS-ENCLOSED WALKWAY at the halfway point lets motorists who stop on the near side of the dual road cross safely to restaurant at right. There are gas stations on both sides.

pression, or ditch, between traffic lanes. But through the years this has filled up, with the result that cars going out of control hurl themselves head-on into the approaching lane.

The Merritt Parkway in Connecticut has planted a barrier of trees that is very beautiful. But time has shown that cars piling into trees kill, too.

Out of that and other experiences came the hump in Oklahoma. The bank rises steeply from the pavement, nine inches in the first 18 inches from the edge. A car that goes out of control from a blowout or other cause usually is on the inside, or passing, lane, nearest the approaching lane of traffic. Without an effective barrier it would careen into the opposite-traffic lane.

The hump serves to throw the car back into its own lane so that the accident happens with the wild-car driver going in the same direction as cars in front, behind and beside him.

In a really bad accident, the car could be thrown at right angles to the hump. Then it could go over into the opposite lane. A study of accidents, however, shows that either of two things happen: 1) a slow-moving car hangs up on a high center, straddling the hump, practically undamaged; 2) a high-speed vehicle uses the hump as a ski jump, hurdling over the opposite pavement onto the shoulder, clearing the approaching lanes almost immediately.

Crossing the Hump

Another function of the hump is to help prevent accidents by serving as a mental obstacle. Covered with grass, it appears to be much higher than it really is. But it is still high enough so that a driver cannot cross it readily, even on purpose.

Visibility is another important factor. Engineers claim that there isn't a point along the highway where a driver can't see an object four inches high at least 700 feet ahead. An average driver with average brakes can stop a car going at 70 within 400 feet.

The Oklahoma turnpike greets its toll-payers with a "friendly reminder" card that reads, in part:

"Almost all accidents on the Turnpike have been caused by the following:

1. Blowouts at high speeds.
2. Drivers going to sleep.
3. Brake failure at toll booths.
4. Weaving cars and trailers.
5. Following too close.

"A 45-mile-per-hour limit has been placed on cars pulling house- or 4-wheel trailers. We cannot do anything about the other causes. You can." END

STUBBORNLY Joe shoved the knotty piece of wood into the circular saw. It groaned, dragged, and stopped dead. Swearing, Joe yanked the work free and went to the fuse box. But no fuse was blown. Afraid that the motor had burned out, he bent over the saw to feel the housing. It wasn't hot, but the moment he touched it the saw started up again, giving him a scare he never forgot.

...How Come?

ANSWER: *The motor was protected by a thermal overload relay. This opened when Joe stalled the blade, but in the time it took him to check the fuse box it cooled off again. As he hadn't turned off the switch, the motor promptly restarted.*

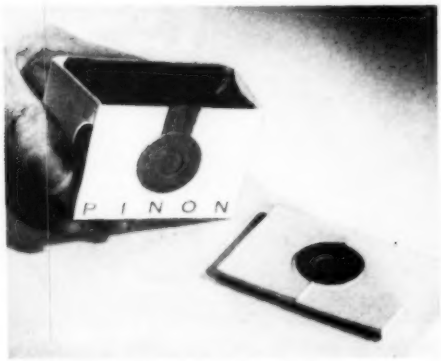
Foot Pontoons Let You Walk on Water

THIS cautious gal is making an indoor dry run to try out a pair of foot floats exhibited at an inventors' fair in Belgium. Each float is composed of four inflatable rubber compartments which, says the French inventor, give the footwear "floating stability."

But he doesn't mention what happens if you lose your balance while paddling, and take a nose dive into the drink.

Car Plates Identify Ham Radio Operators

HAM radio operators in 25 states can carry their call numbers on their car license plates. The system makes it easy for civil-defense officers and police to identify operators for quick communication in emergencies.



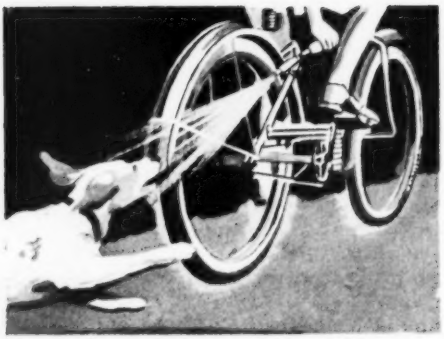
Camera Shoots Only Once

THE camera above takes one picture; then you throw it away. It unfolds into a box with a paper tab for a shutter and a hole for a lens. The Taylor-Merchant Corp., NYC, sells it as a give-away premium.

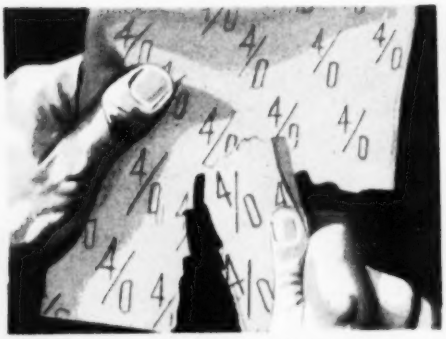
Plastic Armor Shields Police

THIS glass-fiber-and-plastic shield blocks .45-caliber bullets fired point-blank from a distance of 20 feet. A policeman ducked behind it can watch his opponent's moves through a bulletproof window.

I'd Like to see them make...

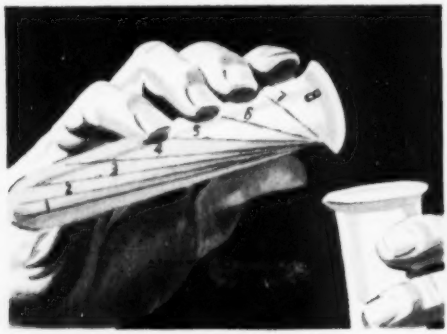


A WATER SPRAYER to fit a bike so the rider could squirt dogs to discourage them from chasing after him or biting at his legs.—*Mrs. Ludvig Peterson, Thief River Falls, Minn.*

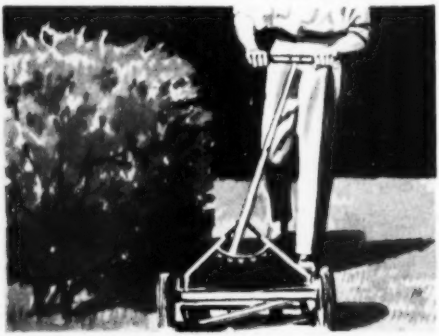


ABRASIVE PAPERS with grit size stamped all over the back. As now marked, once you tear off the number, you can no longer identify the sheet.—*J. J. Richards, Brookline, Mass.*

A PLASTIC TIRE COVER for the spare so luggage and other items packed in the car trunk would not get soiled with road grit and grime.—*Melvin R. Turner, Modesto, Calif.*



A GRADUATE with markings so placed that they give a constant reading of the amount of liquid in the container while it is tilted for pouring.—*Eugene Reiser, NYC.*



A LAWN MOWER with a handle that moves horizontally toward one wheel, making it easier to mow close to, or under, hedges and bushes.—*Larry Edwards, Hereford, Tex.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by *Popular Science Monthly* readers. What is *yours?* We will pay $5 for each one published. Please use government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

A SAVAGE TWIST OF TORQUE, balked in its effort to turn the blocked rear wheels, causes this tractor to do a back flip. The man at the left has engaged the clutch by tugging rope.

How Not to Drive a Tractor

Dummies are used by agricultural colleges to shock farmers into awareness of the perils of handling mechanical horses.

By B. F. Sylvester

A LARGE crowd at a county fair in the corn belt circled a demonstration of how to get a tractor out of a mudhole. An announcer held a microphone up to a calm and relaxed figure behind the wheel and said, "Mr. Jughead, you have chained a post to the front of the rear wheels. Will you tell the crowd why?"

"To get traction, of course. The wheels were spinning."

"But isn't it dangerous? Wouldn't it be better to try backing out?"

"Listen here, young fellow. If I didn't take short cuts, I'd never get any of my

IF A MAN instead of a dummy had been in this tractor, his chest would have been crushed by the steering post. The framework was added to protect the tractor during demonstrations.

AN "UNSEEN" LOG seven inches square is about to toss this tractor on its side, demonstrating the danger of going too fast on rough ground or where obstacles may be hidden.

work done. Now watch her climb out."

The clutch was engaged, but the wheels did not turn. Instead, the power, blocked off at the axle, went where it could. Up reared the front end and flipped the chassis over on its back.

The crowd gasped and several women screamed. The demonstration crew rushed in to try to extricate Jughead, caught by the steering post and being soaked by gasoline and oil, which might catch fire.

The announcer pushed the mike toward the victim. The crowd heard a groaned, "Maybe I was wrong," and then nothing. It was all over for Jughead —but only for the time being.

Jughead is a realistic dummy, created by the University of Nebraska's College of Agriculture. He is enlisted in a war against the heavy annual toll of dead and injured in farm-tractor accidents.

Next week, with a new head and patched-up body, Jughead would wake up some other farmers to the dangers of operating a vehicle with the short wheelbase and high center of gravity required for farm work.

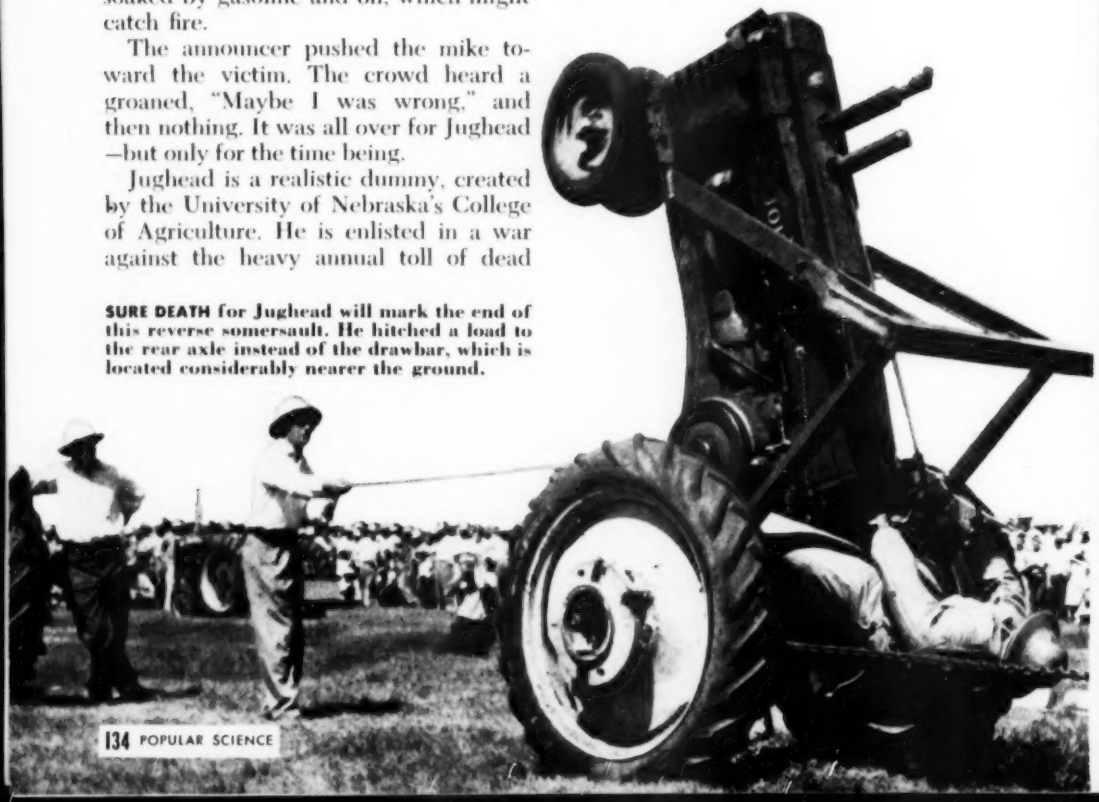
Even at Five M.P.H.—Tractors Can Kill

The farm tractor operates normally in an open field, at five miles an hour or less. Yet, statistically, it is between one-third and one-half as deadly as the automobile.

In Nebraska, with a motor-vehicle population of 693,000, there were 320 highway fatalities in 1952. The tractor population of 130,000 claimed 28 lives in the same period, a ratio close to that of other corn-belt states.

The National Safety Council estimates that there were 640 tractor fatalities in the U. S. in 1950, and that the number increases by about 40 each year. More than half were caused by overturning, about equally divided between backward and sideward tipping.

SURE DEATH for Jughead will mark the end of this reverse somersault. He hitched a load to the rear axle instead of the drawbar, which is located considerably nearer the ground.



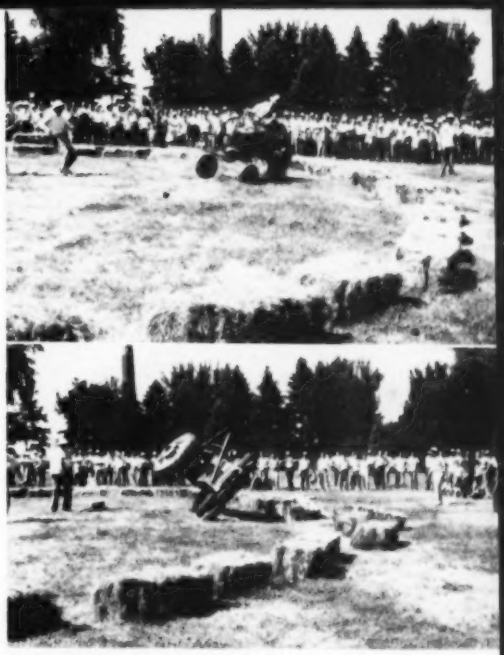
Nebraska "Ag" college authorities had been preaching tractor safety for several years, without much headway, when an accident on their own farm in 1952 woke them to a new approach.

An instructor was mowing weeds along a drainage way. The ground was soft and the tractor started to dig down. The mower appeared to be catching in the mud. It was a hot afternoon and the operator was rather hot under the collar. He unhooked the blasted mower and took off the blasted drawbar, so it wouldn't catch in the blasted mud. He climbed back onto the seat and pushed down on the gas. The tractor reared and fell over backward on top of the mower. Happily, the operator jumped clear.

Lloyd W. Hurlbut, chairman of the Department of Agricultural Engineering, and his colleagues decided to re-enact the tractor upset and take it to the farmers. They dug up a 1941 tricycle-type tractor owned by the university, and constructed the dummy. They worked out a system of remote control by which the tractor could be steered, the clutch engaged and disengaged, and the ignition shut off at safe distances.

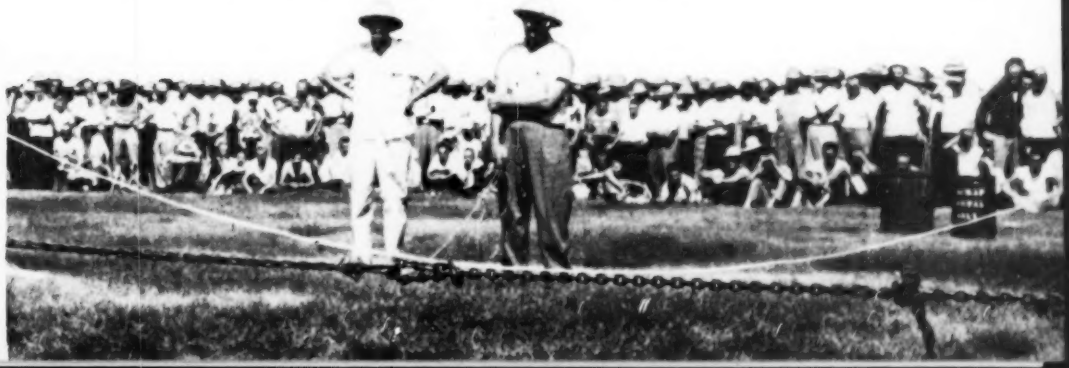
More Traction—Jughead Style

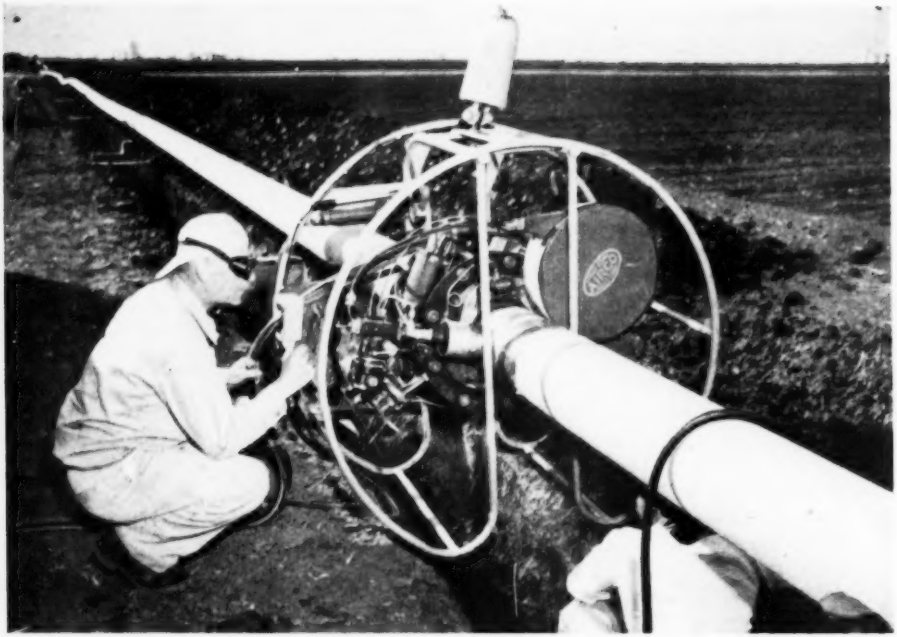
Jughead and his tractor usually are upset four times on each program. One demonstration shows the right and wrong ways to hitch loads. The proper hitch is to the drawbar, which is 16 to 18 inches from the ground. Sometimes when the load does not move, the operator hooks up to the axle with the idea of gaining traction. The axle is about 30 inches high, because a tractor must have clearance for the last stage of cultivating corn. When Jughead, by proxy, hitches to the axle and steps on the gas, the front end comes up and the tractor topples over on him.



SAD END FOR SHOW-OFFS is forecast when Jughead, with his kid brother Bozo on his lap, takes a corner too fast. The tractor tips sideways and lands on top of both dummies.

Iowa State College took up the program in 1953. It introduced the idea of wiring the driver for sound, for the public-address interview. Nebraska picked up that idea this year. The University of California's College of Agriculture began tractor-tipping demonstrations in January this year. Colorado A. & M. started them in February, Cornell in March. Similar programs are under consideration in North Dakota, Texas, Idaho and Missouri. Ontario Agricultural College heightens the excitement of the safety lessons by using a live operator instead of a dummy, protecting him with a shield that keeps the tractor from going all the way over. END



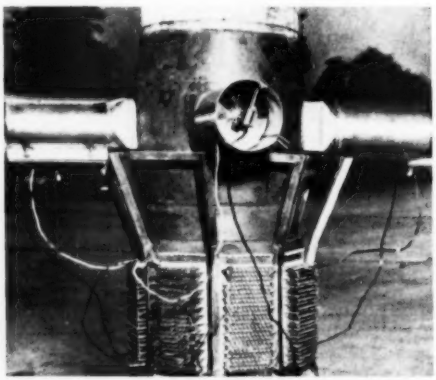


Push-Button Welder Speeds Laying of Aluminum Pipeline

ALUMINUM pipe is welded automatically with a new machine that straddles and grips the pipe. You just push a button to make the weld. When the job is done, the machine stops, reverses itself and returns to the starting position for its trip to the next joint on the gas pipeline. Reynolds Metals Co. and Air Reduction Sales Co. developed it.

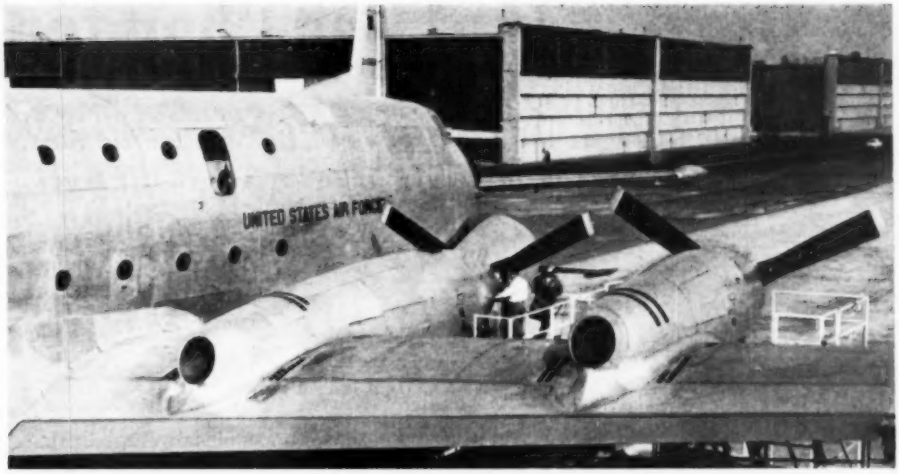
Bog-Trotting Tractor Hunts Oil

OIL prospectors will ride the tractor above in north Canadian bogs where a man can't walk without sinking. A sister of Gulf Oil's marsh buggy, it has 29-inch-wide tracks to slog over the thick, water-soaked layers of moss and dead trees called muskeg.



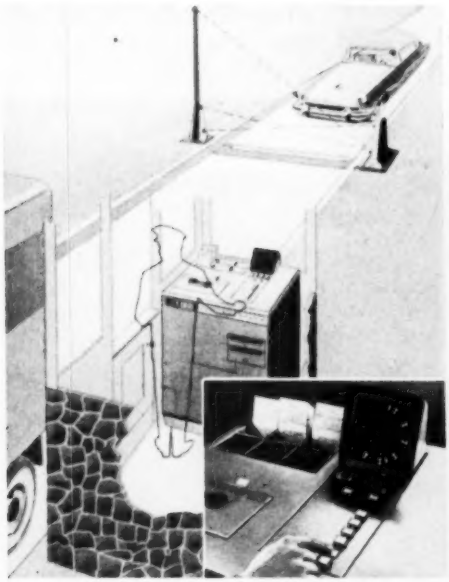
Furnace Powers Its Own Blowers

A NEW furnace not only heats air but generates its own electricity to run the fans that circulate the warm air. The trick: 2,400 thermocouples in the combustion chamber. Prof. F. J. Bordt Jr. of Rensselaer developed the self-powered unit for the Army.



Jet Exhausts Add to Prop Power of New Air Force Transport

THE power packages in the wings of this Globemaster—the Air Force's first four-engine turboprop transport—put out 5,700 horsepower apiece. The jet exhaust scuttling out behind gets credit for a 20-percent chunk of power of each engine, a Pratt & Whitney T-34. The rest comes through the propeller, spun by the turbine.



Electric Eye to Aid Toll Taker

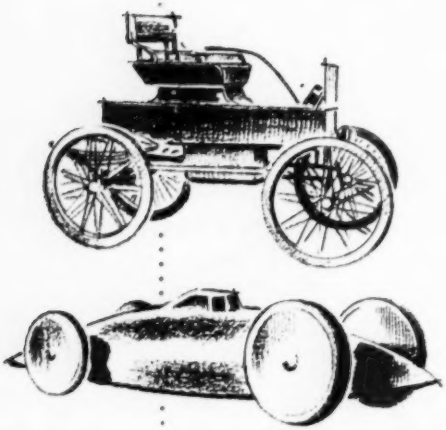
ELECTRIC eyes will count the axles while automatic scales weigh vehicles approaching new toll booths to be installed on the Pennsylvania Turnpike. A screen (inset) will indicate the axle count. There's also an electronic bookkeeper in the IBM setup.

Farmers Get a 25-Foot Lift

THIS tractor attachment stacks, loads, lifts or pushes. It can work 25 feet up or keep its nose to the ground with a 'dozer blade replacing the platform shown. The American Road Equipment Co., Omaha, designed it for Fordson Major tractors.

The Car That Has Changed

You wouldn't know the luxurious old Baker Electric now, but it still survives in the body of today's fork-lift truck.



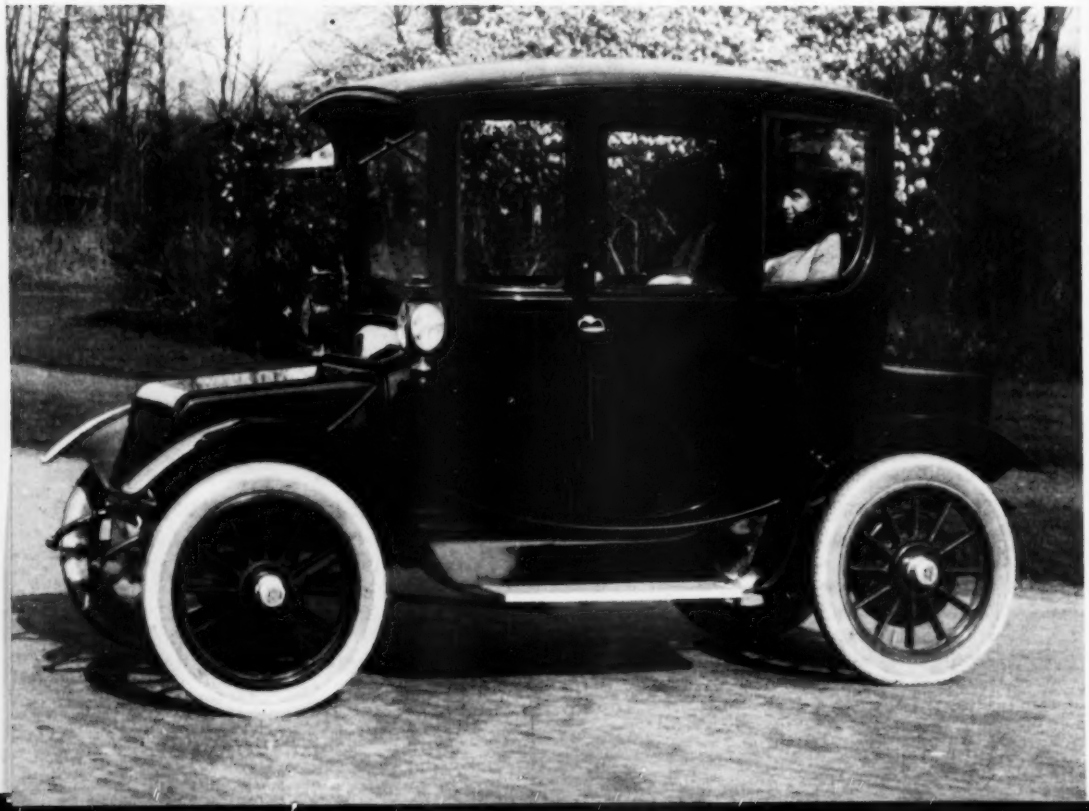
By Wesley S. Griswold

THE stately and luxurious Baker electric automobile is as dead as the mustache cup, but its soul goes rolling on. In fact, it is working for a living—in complete disguise.

Essentially the same power plant that once sent sedate broughams and coupés whispering along exclusive avenues now moves silent little fork-lift trucks along U.S. factory floors.

The two vehicles couldn't look less alike, but their utter dissimilarity is only skin-deep.

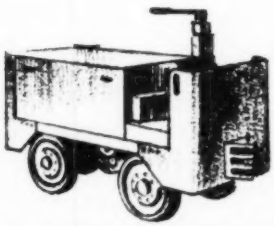
Yesterday's Bakers, of the untroubled half-dozen years before World War I,



the Most

were called "showcases." Through their ample windows, the envious public peered at a display of cut-glass vases, embroidered door pulls, silk window shades, rich upholstery, front seats that swiveled, cigar lighters, vanity cases and sometimes electric fans and foot warmers.

Today's Bakers are strictly work horses. They have been stripped of every fixture not essential to heavy duty and have been fitted with powerfully developed hydraulic muscles. With these, and an extensive variety of attachments, they pick up, push, roll, hoist, stack, load, unload, twirl and dump the



THE STRANGE FAMILY TREE of the Baker Electric stems from the plain-Jane horseless carriage, made in 1898, shown in the top drawing on the opposite page. Out of this, in 1902, developed Walter Baker's record-breaking, ill-fated electric racer, the Torpedo, shown in the sketch beneath. By 1914, as the photo at left shows, the electric passenger car was in its full glory. The sketch directly above is of Baker's first electric materials handler, produced in 1920. At right is its rugged, highly versatile descendant, a hydraulic fork-lift truck. The power plant of these five outwardly dissimilar vehicles has been essentially the same for 56 years.

raw materials, finished products and wastes of hundreds of American industries.

Yet the fat Baker of the past and the lean Baker of the present have these fundamentals in common:

- Straight-type, top-mounted worm drive.
- Batteries of practically the same voltage.
- Motors so nearly alike that most of the parts numbers have not been changed in more than 40 years.
- A single lever to govern forward and backward movement and speed, by controlling the amount of resistance between battery and motor.

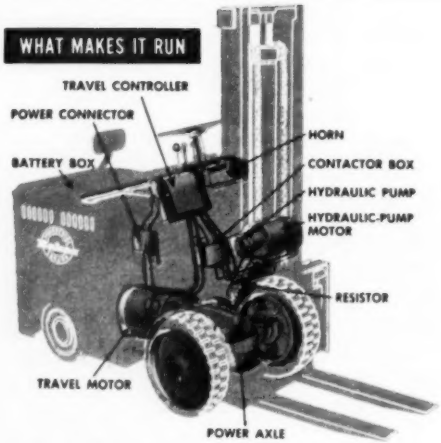
From Luxury to Lager

The principal difference between the vitals of the two vehicles is that the ampere-hour rating of the old-time battery was an anemic 200 to 225 per cell. The ampere-hour rating of today's battery is a robust 450 per cell.

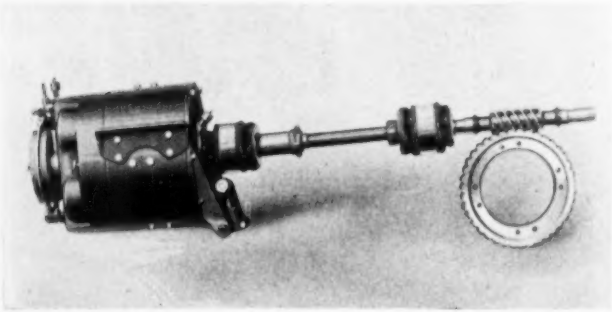
The original Baker Electric has gone through as many reincarnations as a Buddhist's great-grandmother. After its initial existence of luxury and ease, it next turned up in brewery trucks, express vans, ambulances, police patrol wagons and even fire trucks. Then came a brief and giddy life with a gasoline engine, in the innards of the rich and rare Owen Magnetic car. Finally, in a fourth existence, it took the humble form of an industrial truck, a materials handler. That was about 37 years ago, and it has not changed much in looks since then, though its versatility has grown mightily.

Walter C. Baker, then 30, produced his first electric car in Cleveland in 1897. It could travel only 20 miles on a single charge and was about as stark a version of a horseless carriage as could be imagined. A 10-cell battery, arranged in two trays, was hidden under the buggy seat. A three-quarter-horsepower motor bulged slightly below the floor. A single chain ran from the motor to a sprocketed wheel mounted on the rear

Inside a Work Horse:



AS IN THE OLD DAYS, what makes a Baker electric vehicle run consists of battery, controller, resistor, motor and worm drive.

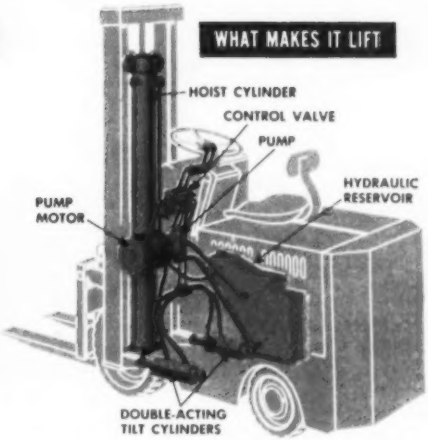


WORM-GEAR DRIVE was introduced in Baker electric passenger cars about 40 years ago. Above are its essentials, as they then looked.

THE WORM STILL TURNS the driving axle of a Baker Electric (above, right). For the fork-lift truck, the assembly has been telescoped.

How a Fork-Lift Truck Does Its Job

WHEN THE OPERATOR GETS UP, nobody can move the fork-lift truck. The seat then tilts forward and automatically sets the brake.



MUSCLES FOR MANY TASKS are controlled by metering, which allows the operator to govern lifting, lowering and clamp pressure.

axle. The 550-pound car was steered, in the manner of a child's express wagon, by a tiller extending straight at the driver from the center of the dashboard.

For the first three years, this model was not strikingly improved. Still, it charmed Thomas Edison and his wife, who came to Cleveland to buy one in 1901.

Torpedo Is Pointed at Both Ends

Baker and his electric car did not become well known until May 31, 1902, when together they were involved in a fatal accident and made tragic and spectacular headlines. Like many other automobile builders of the day, Baker had constructed a racer to advertise his product. The Torpedo, as it was called, was an extraordinary car, years ahead of its time in design. Slightly more than 18 feet long, less than four feet wide and far lower than its competitors, the racer was sharply pointed at both ends and looked like the hull of an overturned sailboat.

The Torpedo's body was made of white pine and basswood, covered with black canvas. The huge wheels had wire spokes, hidden by canvas shields, and wooden rims. The tires were inflated to 125 pounds' pressure.

Baker and an electrician huddled on hammock canvas seats, one in front of the other, in the center of the hull. Only the tops of their heads were visible, under a low canopy skirted with isinglass.

The Torpedo's single motor was mounted behind the men and drew its power from a 40-cell battery divided into eight sections, which were distributed around the interior of the hull. Two chains ran from the motor to sprockets on the rear axle.

Tragedy Stalks Racer

On the afternoon of May 31, 1902, in the course of speed trials held by the Automobile Club of America on Staten Island, N. Y., Baker's Torpedo leaped out of control at 78 miles an hour on a bend in the nearly straight macadam course and slammed into the crowd. One man was killed and nine other persons, one of whom later died of his injuries, were hurt. A bicycle that got in the way was

cleanly cut in two. The Torpedo's body lay pried from its frame like the lid of a crudely opened tin can, but its occupants luckily were unharmed.

Although the Torpedo was repaired, Baker seldom raced it again.

Henry Ford Liked the Baker

Bad publicity crimped Baker's sales of his more conventional electrics for a short time after the Torpedo ran wild, but the quality of the car soon won it many admirers.

Ford, then producing a large, gasoline-powered, six-cylinder model, was heard to remark that he wished he could build a car as well made as the Baker. Diamond Jim Brady owned a Baker, and the King of Siam ordered a special runabout. It had pigskin seats and an ivory tiller. The body was painted white with gold trim, and the royal crest decorated each side.

The electric passenger car was essentially a woman's car, because it was so quiet, clean, safe and easy to operate. It had approximately as many moving parts as today's electric fork-lift truck—fewer than 20. A lever attached to the left wall of the car governed the speed and determined whether the car went forward or backward. It was called the controller, and moved in the same plane as today's hand brake. In the models of the electric's heyday, the controller provided six forward speeds, ranging from about four miles an hour to 20, and three reverse speeds.

On the top of the controller handle was a button. This rang a bell or sounded a klaxon, depending on how forceful a person the owner was. The driver steered by pushing or pulling on a tiller that extended horizontally across his lap from the left wall. (Walter Baker claimed to have originated the left-hand drive.) The tiller could be folded straight up against the wall when the car was parked.

Lightning Getaway—20 M.P.H. Speed

The last few models of the electric car replaced the tiller with a steering wheel, if the buyer requested it. The controller then was mounted on the right side of the steering post.

The Baker Electric, in its best years, had a remarkably fast getaway. But, quick as it was to attain full speed, its maximum effort was rarely more than 20 miles an hour. And much emphasis was placed on taking advantage of gravity.

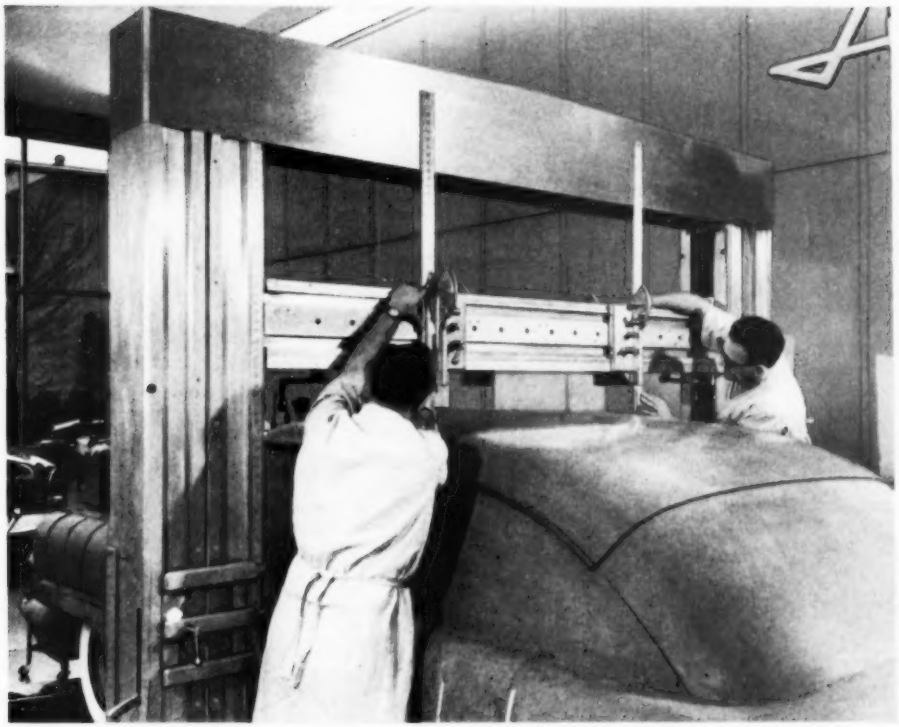
"Always coast on down grades," a Baker book of driving instructions advised.

Before the elegant electric deigned to become a drab bomb handler, in 1917, it

[*Continued on page 252*]

BACK-SEAT DRIVING was the rule in electric passenger cars. This late Baker (1915) provided a duplicate set of controls in front.

GRANDFATHER OF FORK-LIFT TRUCKS was this shell handler, with exposed innards, that Baker built for the U. S. in World War I.

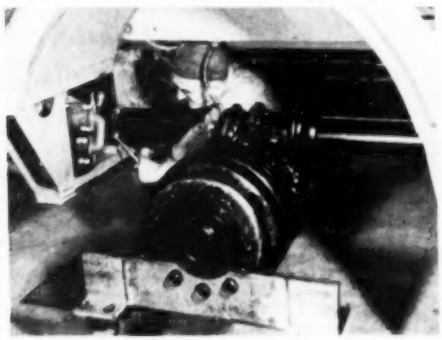


Giant Mobile Calipers Help Sculpture Next Year's Automobiles

CALIPERS big enough to span a car help engineers build full-scale clay mock-ups for new models. Accurate to 1/10,000 of an inch, the crosspiece can be raised and lowered at any angle to transfer a designer's dimensions from blueprint to clay. The "modeling bridge" rides tracks laid on the floor of the Ford plant.

Bus Rides on Rubber Springs

RUBBER bonded between a metal shell and a central shaft forms a new bus spring. One part turns while the other stays still. The twisting, "wind-up" movement in the rubber makes riding easier, says Goodrich.

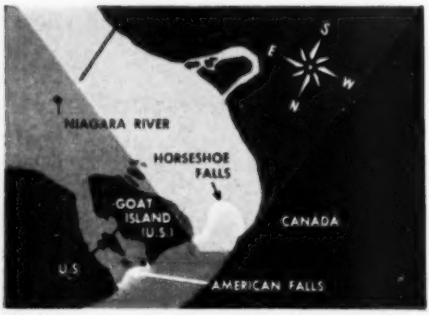


Air Gunners Get Plastic Target

PROBLEM: A tow target capable of withstanding the crushing, frigid clutch of high altitude while being towed at supersonic speed. Answer: The plastic XM-24 above. Bellanca, which developed it, says it won't shatter when hit by shell fragments. A parachute floats it gently to earth to train gun and radar crews another day.

To save Niagara's sagging old face, engineers are altering the river bed around the falls.

Niagara Gets a Face Lift



V-shaped area encloses the view seen above.

Rock surgery will restore newlyweds' favorite falls, now badly showing its age.

By George H. Waltz Jr.

VISITORS to Niagara Falls these days are getting, besides the standard view of one of the world's great natural wonders, a grandstand seat for a feat of engineering know-how and daring that has

They are excavating and filling behind cofferdams, and building a permanent control dam.

never before been attempted anywhere.

Among other things, it involves rearranging the solid shelf of rock just back of Horseshoe Falls' crest to restore and preserve its beauty. To do this, construction men—boom operators, 'dozer drivers, dragline handlers, drillers and dynamiters—are working literally in the midst of the tumbling waters of the Niagara River cascades.

At times they are just a few feet from the exposed lip of the falls, with little but a hand line between them and the gorge, 160 feet below.

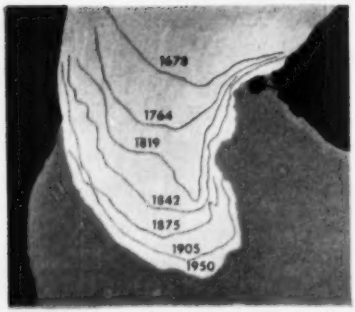
By the time the job is done—in 1957—Canadian and U.S. workmen will have drilled more than 20,000 blasting holes, used more than 60,000 pounds of dynamite and removed some 500 million pounds of rock from the river bed above the falls. The falls, according to the engineers, will be prettier than they have been for years.

For some time now, Niagara's beauty has been fading. The continuous eroding action of the more than 300,000 cubic feet of water that plunge over the brink every second has gradually deepened the bend in the Horseshoe Falls.

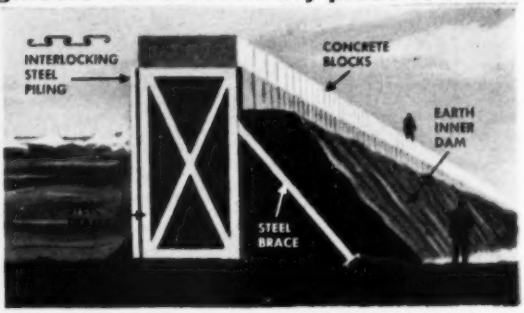
Falls Are Moving Upstream

At the central point, along the boundary between the U.S. and Canada, during certain periods the hard dolomite rock lip has been worn away as much as five feet a year. In the 276 years since the falls were first surveyed, the inner arc has been eroded back, moving upstream

This is how engineers will create a dry place to work.



EROSION over the centuries since its contours were first recorded has cut back deeply into the lip of Horseshoe Falls. Engineers will slow this.



HUGE COFFERDAMS, constructed right in the midst of the swirling waters of the cascades, will allow workers, dry-shod, to build the control dam upstream and to do the required excavating and filling at the falls.

toward Buffalo, as much as 1,300 feet.

Even more damaging to the scenic effect is the fact that the erosion has funneled more and more of Niagara's water toward the Horseshoe's center and away from the Canadian and U.S. ends, where in spots it has been reduced to trickles. Besides giving the falls an untrimmed, gap-toothed look, the uneven distribution has robbed the spectacular wall of water of its once-famous deep aquamarine color.

In 1950, both Canadian and U.S. experts decided that something should be done about it. The extensive, $17,000,000 face-lifting operation started late last summer and will continue around the clock and around the calendar, winter and summer, until it is completed.

$14,000,000 Worth of Gates

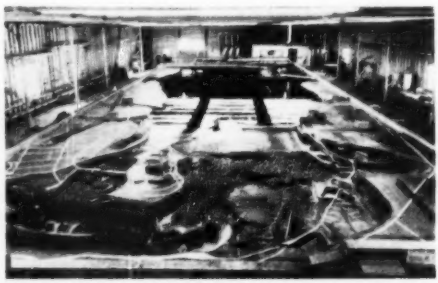
Basically, the beauty treatment consists of three major construction projects.

The most expensive is a $14,000,000 control dam. Jutting out into the river for 1,500 feet from the Canadian shore, about a mile above the falls, the dam, with 13 individually controlled gates, will make it possible to divert and balance the flow of water to provide an even distribution over the falls at all times.

Unlike most water-control works, whose gates lift or swing up, these gates will be hinged at the bottom and will tilt toward the falls when they are opened. When ice jams fill the river, the gates will be tilted down just enough to skim off the surface ice without interfering with the desired distribution of water.

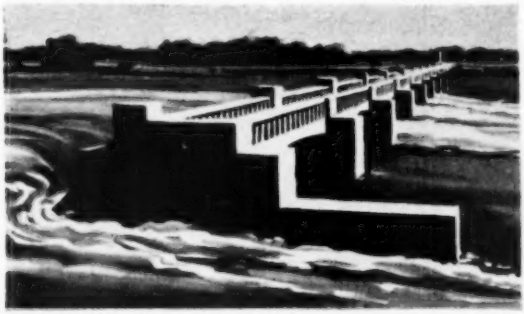
Once the dam has redistributed the water as desired, excavations and fills at the flanks of the falls will guide the water toward the crest in an even flow. To preserve the beauty of the tumbling cascades above the falls, these large excavations will be literally sculptured into the rock, to duplicate as nearly as possible the natural, uneven contour of the river bed as it exists today. In effect, the river bed will be the same, only deeper—in spots, as much as 9½ feet deeper.

To hold back the churning torrent of water that often speeds over the crest at close to 25 m.p.h., stout cofferdams—watertight enclosures—are now being

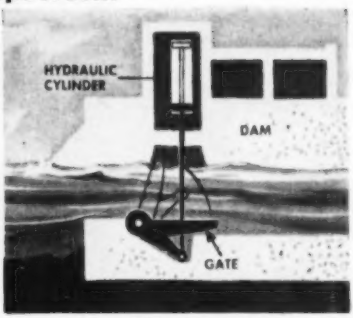


PRELIMINARY RESEARCH for the face-lifting project was carried on by means of this elaborate scale model of the falls at the Ontario Hydro-Electric Laboratory, Islington, Ont.

This is how the falls' lifted face will be kept fresh.



CONTROL DAM being built about a mile above the falls will serve as a giant faucet. It will govern the flow of water not only for the beautified waterfall but for additional plants of the Niagara power project.



DAM GATES will be hinged at the bottom and operated by hydraulic cylinders. Ice pressure of 250 tons will open them automatically.

built around areas where major surgery is planned.

These cofferdams are being built strong enough to hold off water that will be surging against them at impact pressures as high as 1,100 pounds per square foot. Moreover, since the solid rock bed of the Niagara River makes it impossible to drive in piling to get anchorages, the dams will be held in place by sheer weight. Mammoth concrete blocks, weighing almost as much as a diesel locomotive, will be stacked on each 10-by-30-foot section.

Giant Braces Will Support Coffers

When a dam has been built to surround a desired area completely and the water had been drained off (or pumped off, in the case of the control-dam area), the coffers will be strengthened on the inside with dirt-and-steel angle braces fastened to the river-bed rock.

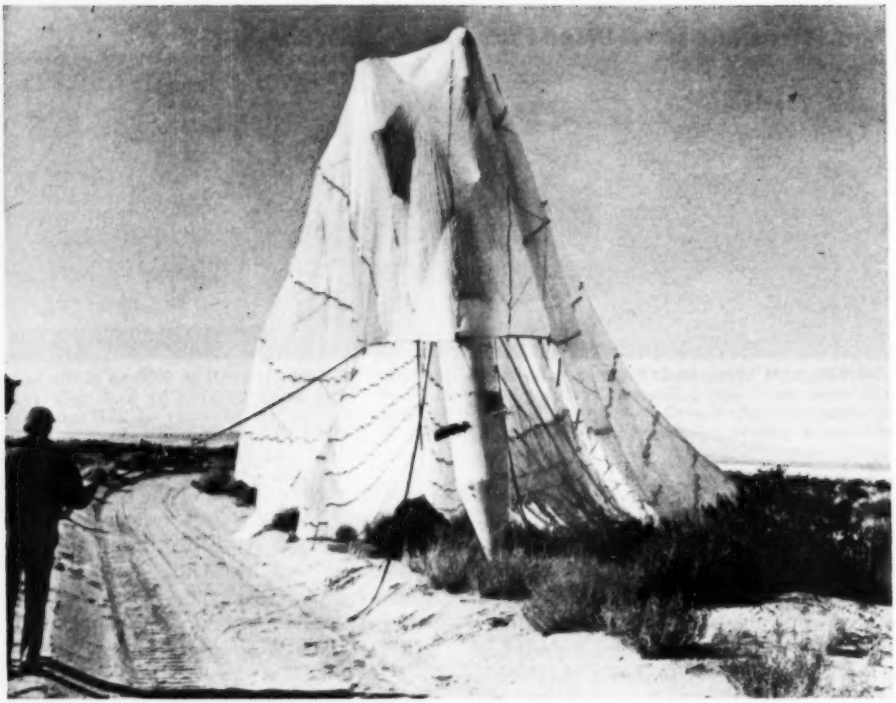
If present plans work out, sidewalk superintendents who visit the falls during the next few years will get special treatment. There will be no need to peek over board fences to get a look at the work. On the American side of the falls, the U.S. Army Corps of Engineers—which, under the direction of Col. Phillip Garges, is in charge of operations on this side of the border—is already constructing special viewing ramps and exhibits that will explain the work.

At the famous Maid of the Mist House, maps, models, drawings and movies will explain the job from beginning to end. Attendants will be available to answer questions. On Goat Island, at the American side of Horseshoe Falls, spectators will be allowed to stand almost at the

SOUNDING OPERATIONS at the perilous rim of Horseshoe Falls, essential to the engineers' plans, were conducted by lowering the gear from a helicopter hovering overhead.

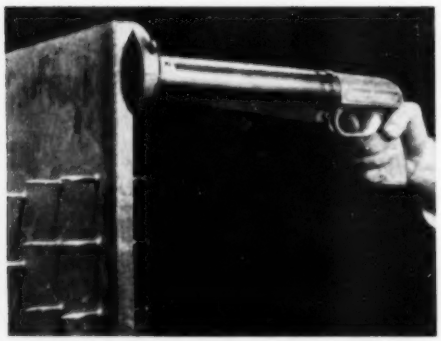
edge of the excavation area and within a few hundred feet of the giant cofferdam itself.

Engineers say that it's worth getting married, just to see the spectacle. END



Peaceful Missile Nose-Dives from B-29 to Test Parachute

THE missile above has just plummeted to earth to test a parachute. As the chute blossomed from one fin, a high-speed camera in another fin took movies of its performance. A crane will yank Cook Research Labs' Skokie from the Mojave Desert sand—it is stuck on its long nose spike—for another drop from a B-29.



Pistol Shoots Spikes into Steel

FOR builders—not cops or robbers—this pistol shoots fasteners into concrete or inch-thick steel plate. Its powder load will pound home pins and studs ⅜ of an inch in thread or head diameter. It's called the Ramset Super-Power Jobmaster.

Earmuffs Keep Out Noise

THE men above are cooking plastic "doughnuts" which will end up as earmuffs like the ones the worker at right is wearing. They protect hearing on noisy jobs, such as test-firing rifles. David Clark Co., Worcester, Mass., makes them.

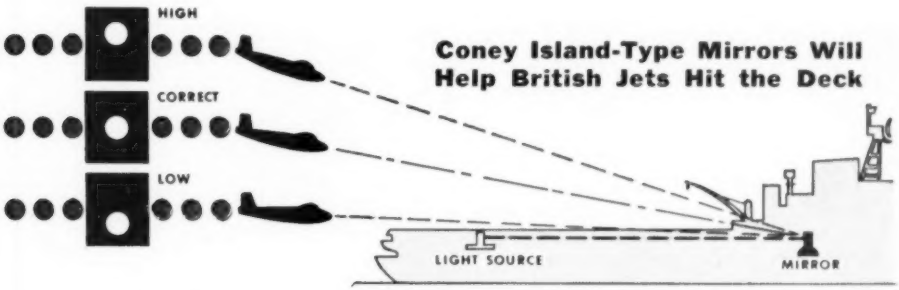
Chill Can't Kill New Heat Lamp

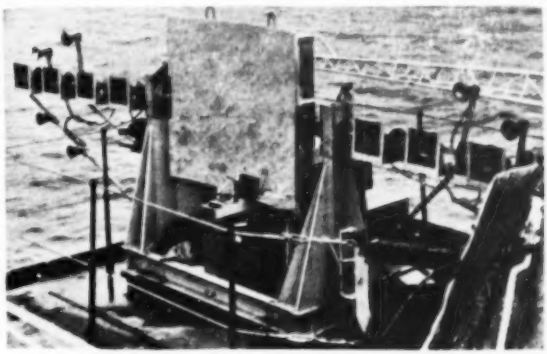
You can pour ice water on a new infrared heat tube without cracking it—even when it is cherry red. But don't try it with your own heat lamp. Secret here is that the tube is made of quartz. General Electric expects the new unit to be used in heating, cooking, drying and baking appliances.

Civil-Defense Radio Fits Pocket

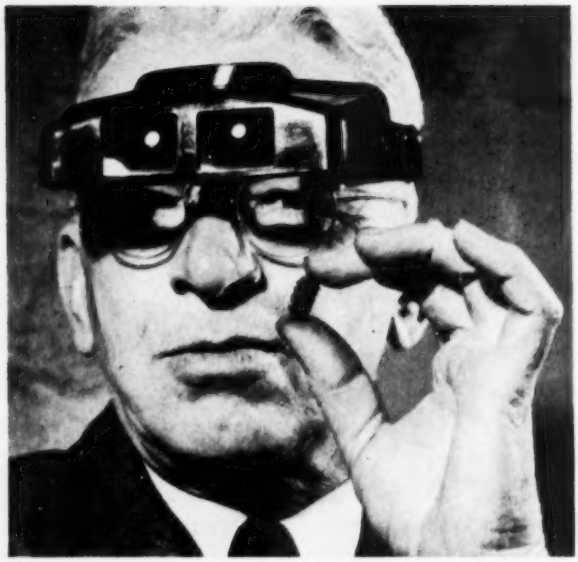
Worn like a hearing aid, this experimental pocket radio is for civil-defense use. It is tuned to the single frequency assigned for emergency broadcasts. The radio has a transistor and germanium diode instead of vacuum tubes, and draws so little power that it runs a month on two dry cells.

Coney Island-Type Mirrors Will Help British Jets Hit the Deck



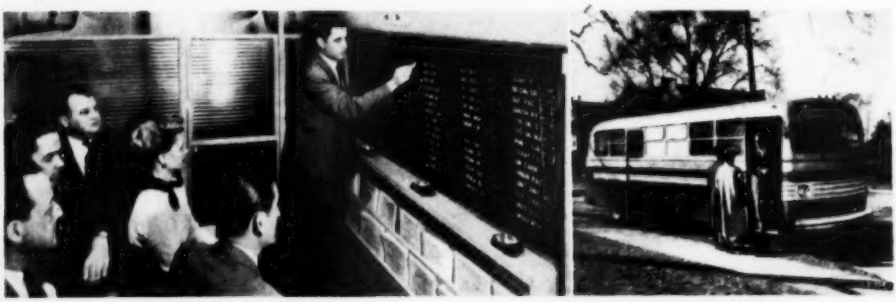


The landing-signal officer is being retired from the flattops of Her Majesty's Navy. A jet pilot approaching a carrier from astern will keep his eye on a large curved mirror (right) on which a blob of light is projected. When he is coming in for a landing at the correct angle to the deck, the pilot will see this light blob lined up evenly with a row of lamps on either side of the mirror, as shown in the sketch above.



Tiny Corn Grew Here 50 Centuries Ago

THAT corn grew on this continent more than 5,000 years ago—probably as a cultivated crop—is indicated by this tiny cob. About the size of a penny, it is displayed here by Harvard botanist Dr. Paul C. Mangelsdorf, who is wearing a combination eyeshade and magnifier. Estimated to be about 5,500 years old, it was dug up in Bat Cave, New Mexico. Corn pollen, at least 60,000 years old, dug up beneath Mexico City last year, is deemed proof that corn originated in this hemisphere, not in Asia as previously believed.



Brokerage Offices on Wheels Take Wall Street to Main Street

LUXURY buses, equipped with complete investment-office facilities, are serving communities around Chicago, Boston and Newark, N.J. Included is a stock-quotation board on which current prices, received by radiotelephone, are chalked up. Merrill Lynch, Pierce, Fenner & Beane, a brokerage firm, operates the mobile salesrooms.

They Say Now .....

DR. HARLOW SHAPLEY, HARVARD ASTRONOMER: *"There is the fanciful possibility that a planet with life could be independent of a star . . . loose, alone, and wandering in space . . . its heat generated by radioactive minerals. It would have no proper day and night; it would probably be entirely dark except for weak starlight and luminescence from radioactivity . . ."*

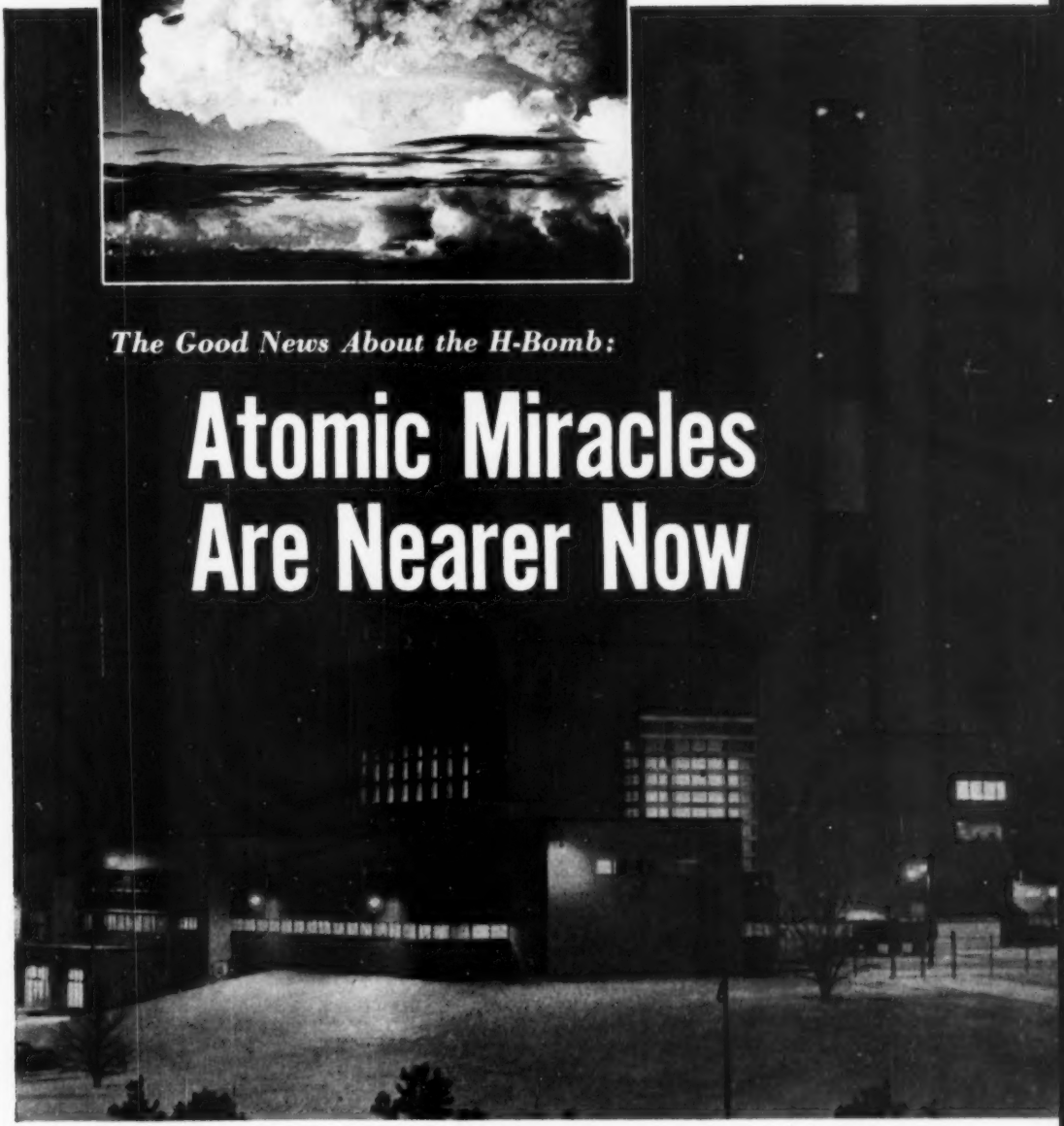
W. H. ROBINSON JR., GENERAL ELECTRIC CO.: *". . . The principal difference between the America of today and that of 75 years ago is electricity. . ."*

THOMAS D. JOLLY, VICE-PRESIDENT, ALUMINUM CORPORATION OF AMERICA: *"After man had standardized on the round wheel, he was free to use his brains to make wheels move faster."*

DR. W. R. BAKER, CHAIRMAN, NATIONAL TELEVISION SYSTEM COMMITTEE: *"Color television in its final fruition may take a little longer than the optimists in the industry predicted."*

The Good News About the H-Bomb:

Atomic Miracles Are Nearer Now



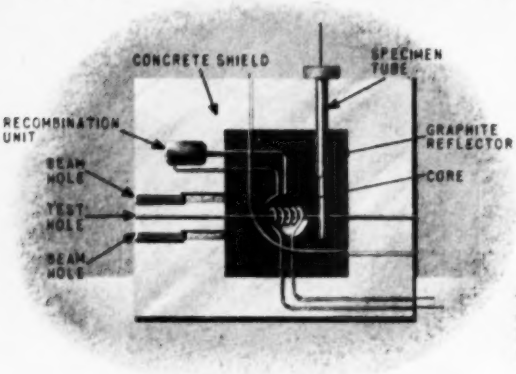
Reactor center of Brookhaven National Laboratory, busy scene of peaceful atomic research.

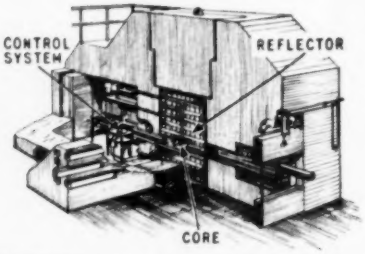
"ONE important result of these hydrogen-bomb developments," Admiral Lewis L. Strauss, Atomic Energy Commission chief, declared when the first photos of an H-bomb explosion were released, "has been the enhancement of our military capability to the point where we should soon be more free to increase our emphasis on the peaceful uses of atomic power."

Signs that the day of atomic miracles is approaching at a stepped-up rate have multiplied this spring.

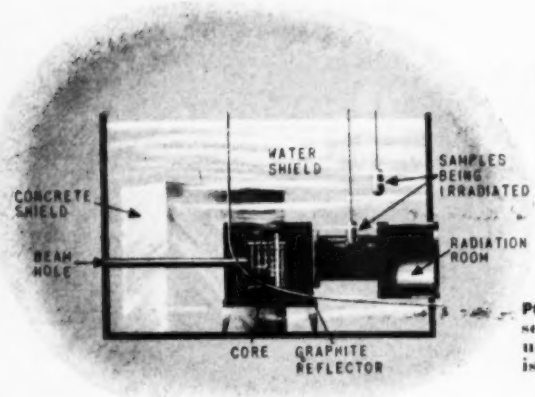
- Plans for developing a feasible atomic-

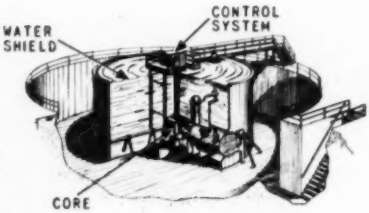
Items from the World's First Atomic-Furnace Catalogue





"TEA-KETTLE," or water-boiler, reactor with a one-foot core of uranium sulfate solution is one of three kinds advertised by North American Aviation.





POOL-TYPE REACTOR, most flexible of research units, using plates of enriched uranium and aluminum alloy for fuel, is also in North American's catalogue.

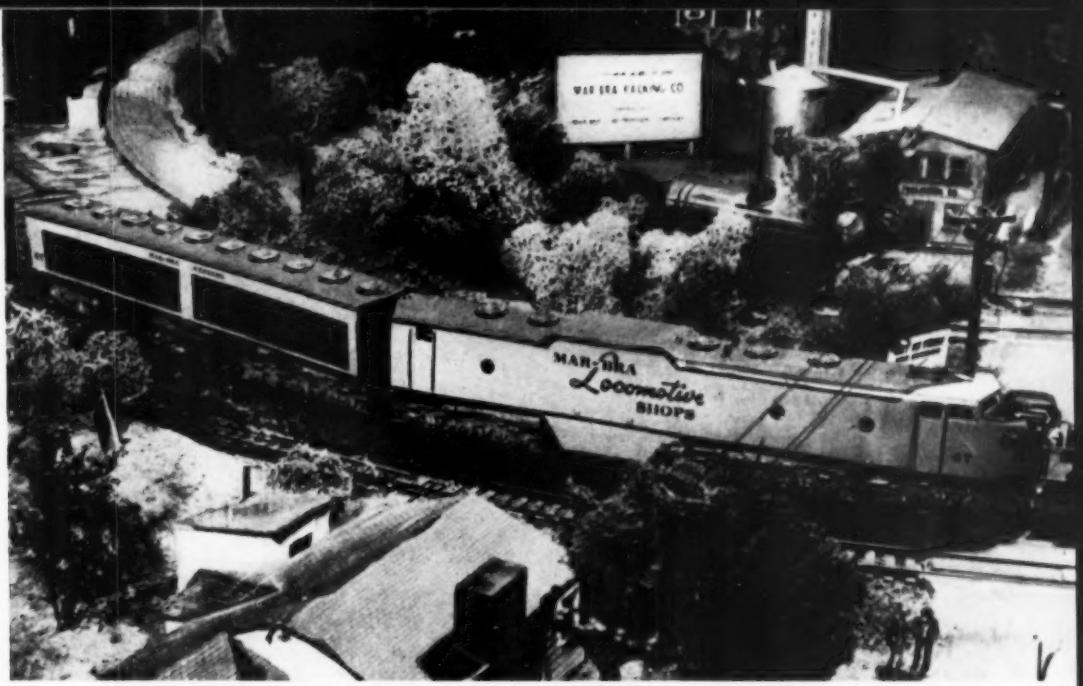
powered locomotive have been disclosed. • A contract for the first full-scale atomic power plant in the U.S. has been let to the Duquesne Light Co. of Pittsburgh. • The AEC has revealed the development of a new type of nuclear reactor, which will convert water directly into steam. This would dispense with expensive heat exchangers in the process of making electricity from atomic fuel.

Dr. L. R. Hafstad, head of reactor development for the AEC, predicts that within five years "we will be building reactors that should be able to compete with power from coal and oil."

With the seed catalogues and fur-storage ads this spring, the postmen delivered a strange, new kind of catalogue —one of atomic furnaces. In this, perhaps the most significant sign of the hastening peaceful atomic revolution, North American Aviation, Inc., presented drawings of three kinds of nuclear reactors that it is prepared to build and fire up for anybody who wants to buy one, subject to AEC approval.

With one of these reactors, you could perform almost any conceivable atomic miracle, save those of making bombs and useful power. You could make certain foods stay fresh for years without refrigeration, create new and better varieties of vegetables, make strange and wonderful new plastics, cause chemicals to combine that nature hadn't intended to link, and make radio-isotopes for the improvement of measuring devices and medical science.

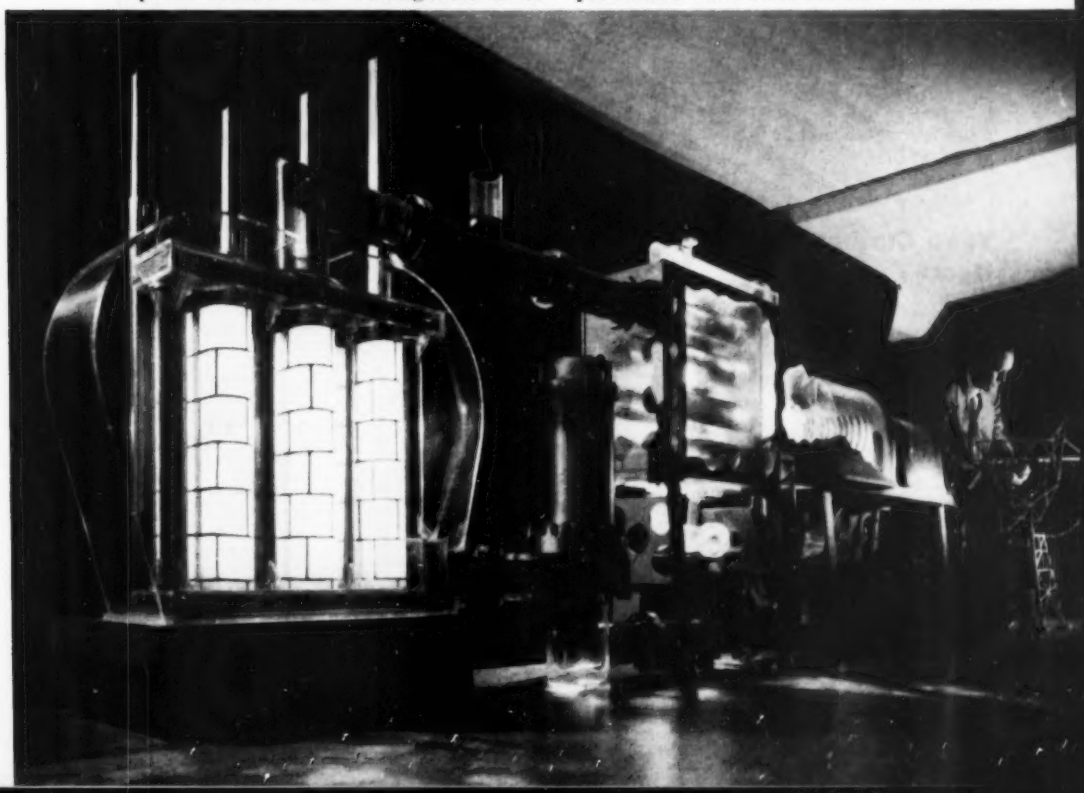
You could make white diamonds turn blue or green, too, if it pleased you. You might even outdo the ancient alchemists by turning baser metals into gold.



THIS IS A MODEL of the 7,000-hp. atomic locomotive designed by Dr. Lyle B. Borst of the Univ. of Utah. Others are at work on plans for atomic-powered merchant vessels.

Previews of Atomic Power Units Designed for Peaceful Purposes

THIS IS A MODEL of the 60,000-kilowatt atomic-power reactor that Westinghouse is to build for commercial use. Uranium rods in pressurized water form reactor's core. END



"Popcorn" Plastic Is Heat Insulator

THOSE big white blocks in the photo at right weigh no more than a little pile of the new polystyrene beads from which they were made. The plastic, said to be a superior insulator, expands greatly under heat, like popcorn, and can be molded into many shapes. Koppers makes it.

Deadly New Missile Doubles as Earring

HANGING from the girl's ear above is a Lazy Dog, a tiny new Air Force missile. It has no explosive charge but penetrates like a .45 bullet when dropped from a plane at 5,000 feet.

Their Clothes Tree Bears Peaches, Too

BECAUSE J. G. Harris of Memphis couldn't bear to chop down a favorite peach tree when he enlarged his home recently, he built a new bedroom around it, letting the main branches pierce the roof (right). He and his wife whitewashed the part of the trunk that was enclosed and now hang their clothes on it.

The tree bloomed fully this spring and is expected to bear a load of fruit as well as part of the family wardrobe.

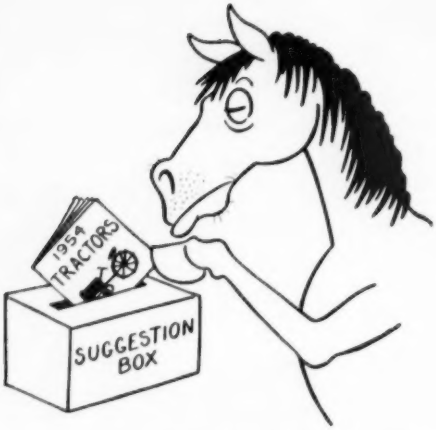
Millions of dollars go out every year to the men and women who can show their bosses how to save money.

Industry Bids High for Bright Ideas

By Ernst Behrendt

THE old suggestion box on the office wall, butt of many a hoary joke, has today become a fantastically successful adjunct in the operation of business, industry and government. All over the country, employers are asking their workers: "Can you think of a way to get the job done better, cheaper, faster?" Thousands of ideas accepted by agencies of the federal government have saved the taxpayer $170,000,000 in seven years. Savings for industry have been estimated at several billion dollars.

These ideas range from the disarmingly simple to the overwhelmingly complex. Bill Moloney received $10 for suggesting that wheels be put under mailbags so that interoffice messengers would not have to carry heavy loads. Tim McCarthy of New York had a way to keep records from smearing: Put blotters between them. Con Edison paid $20. For a highly technical suggestion on how to manufacture better graphite bearings,



Charles Zamiska, a Cleveland foundry worker, was awarded $28,000. He quit his job and bought himself a farm.

Companies are going to a lot of trouble to make you rack your brains for prize money. Many of them have set up elaborate suggestion systems that even include "merit" awards—for "ideas that show evidence of constructive thought but which are impractical for adoption." Some firms, like American Cyanamid, send their staff members provocative memos: "Our records show we have not yet received a suggestion from you. Won't you use the enclosed blank to give us the benefit of your ideas?"

The federal and state governments are just as eager. In Government offices, paychecks are issued together with a message which says, in effect: "Produce an idea, please." The Government has realized, along with private industry, that nobody really knows as much about a job as the man who is actually doing it. He is likely to be aware of things that escape the specialist.

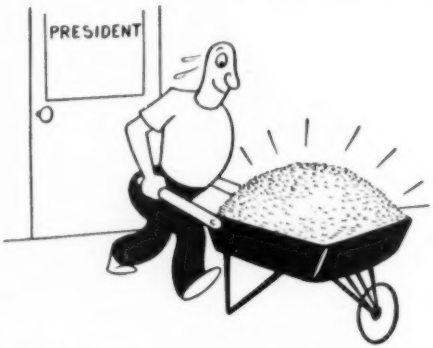
A classic case is that of the woman employee of Remington Rand who noticed one day that a certain office machine had a hole for which she could see no earthly use. It was an intricate machine, whose workings she was supposedly not qualified to grasp. But she went ahead anyway and suggested that the hole be investigated. Some time later, red-faced company engineers admitted that the woman was right. The hole was useless, a leftover from a previous model in which it had been useful. As a result of all this, Remington Rand began saving the cost of a drilling operation, and the employee got an award.

In a similar manner, Army employee J. W. Hill Jr. of Memphis noticed that although no one ever hung up a broom, every broom handle had a hole in it. Hill's sharp eyes are saving the Army $15,233 a year on holes. He got $275.

Labels Saved $7,328

These examples make it obvious that ideas need not be complicated in order to be good. A clerk in Chicago's Drake Hotel suggested that pieces of glassware and china be labeled with their cost and displayed for all employees to see. The idea was to make employees cost-conscious and therefore more careful. It worked. The next year they broke $7,328 less glass and china. Savings to the Drake: $7,328.

To an employer, even tiny improvements may be worth thousands of dollars. Fred Krause, employed by the Whirlpool Corporation in St. Joseph, Wis., figured out a way to save five cents



on each automatic washer; for him the nickels added up to an award of almost $4,000. Stanley P. Wozniak, an automobile worker, managed to slice a few inches off each hose connection; the Buick Motor Company paid him $2,500 for the short cut. At Ford, Pete Saputo discovered that he had an odd job indeed: removing a creak that wasn't there.

Engineers had decreed that unless a jute pad was glued to the back of the seat, the seat would touch the spring and a creak would result. But they were wrong, Saputo found—jute or no, there was no creak. Saputo suggested that he be given a more useful job to do. He was, and $1,500, too.

Today, close to 10,000 suggestion systems are in operation. Many of them have been organized by the National Association of Suggestion Systems (NASS), which was started in Chicago in 1942. Today's list of members reads like Who's Who in Business and Government. It includes members in Great Britain, South Africa and Canada. Every employer, NASS claims, has "acres of diamonds in his own back yard." If he invites his employees to suggest improvements, improvements will materialize.

NASS stresses the "recognition" that workers get when they contribute ideas to the progress of their company. A suggestion system, by shortening the distance between the individual worker and

top management, can be an important tool in labor-management relations. Recognition of a man's importance will never hurt his morale.

A worker who has had an idea accepted and paid for is likely to show that one idea breeds another. Repeaters include people like Nick Sellers, who works for Goodyear. Out of many dozens of his ideas, 51 got adopted, netting him $1,600. Norman Kimball, repairman for Whirlpool, turned in 95 suggestions in 95 weeks and realized more than $3,000.

Awards are usually based on anticipated savings—some companies pay 10 percent, others up to 50 percent, for the first year, and sometimes there is the matter of future royalties. Most Government agencies have an award ceiling of $100 although there are exceptions. The limit at Ford is $3,000; at General Electric, $25,000. Some companies have no limit; they pay a certain percentage of their savings, and the more the better.

At General Motors, 80,309 employees submitted 181,552 suggestions last year alone, and for the 46,503 suggestions that were adopted the company paid $2,419,708.68. Millions of federal employees belong to Government suggestion or incentive award systems. In 1950, employee suggestions made possible annual savings of more than $20,000,000 in the Department of Defense alone.

One Man's Contribution: $250 Million

The prize for the largest savings ever produced should probably go to a Government employee named Raymond L. Graumann. While he was a civilian engineer at the Washington Navy Yard it occurred to him that the 40-mm. shells were not as good as they could be. He decided to improve them. When his work was finished he had doubled their effectiveness. In the single year 1942 he saved the United States $23,000,000, and by V-J Day he had saved the country almost a quarter of a billion dollars. His reward was modest: about $5,500.

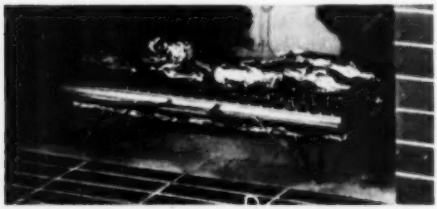
Suggestion systems are not a new idea in the United States. Back in 1880 Yale and Towne offered its employees one dollar per idea, and dutifully paid $10,000 for the suggestions submitted. Since then the system has become an integral part of our business and industrial life, and an invaluable means of steering American ingenuity into productive channels. It is the rare employer today who will not take time to listen to what the worker has to say about his job. As Eddie Rickenbacker, President of Eastern Air Lines, puts it: "No idea is too small to be considered; no idea is too large to be analyzed." END

Screen Built Into Movie Kit

LIFT the lid of a new 8-mm. movie kit and you find the built-in preview screen above. Inside the case are a camera and projector, a camera case, a light bar with two lamps, a cartoon film and a 50-foot roll of color film. Bell & Howell makes the kit.

Cops' Horses Get Tail Lights

LIGHTED stirrups make night-riding mounted police of Stuttgart, Germany, visible to oncoming cars. Modified flashlights fixed to the stirrups cast a white beam to the front, a red one to the rear.



Picnic Grill Cooks Indoors

THIS portable grill cooks outdoors, or indoors in your fireplace, reflecting heat upward from aluminum foil under it. Packed in the carrying case are charcoal briquettes, starter fuel, foil and a pair of tongs. The Reynolds Metal Co., Louisville, makes it.

UN Columns Are Dirtproofed

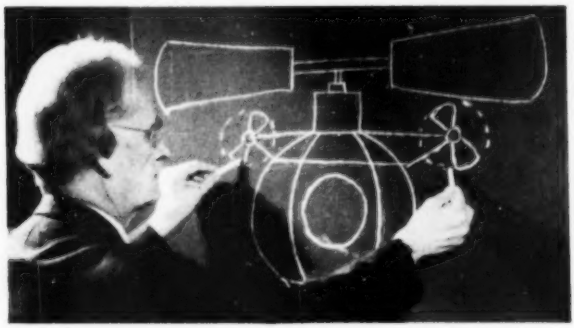
VISITORS streamed in and out while this UN building was decorated. Unhampered by masks or dropcloths, workmen sprayed with an easy-to-clean plastic that dried before fingers could mar it. Progressive Industries, Long Island City, N.Y., did the job.

Tall Tripod Catches the Queen

THE news cameraman above is preparing to shoot over the heads of a crowd. The 12-foot tripod put the camera lens high above the press of loyal subjects greeting Queen Elizabeth and the Duke of Edinburgh on their recent trip to Australia.

Ladder Helps Rapid Reader

GEORGE MURCH, a Denver University student stands on a ladder to do some fast reading while the copy unrolls and drops to the floor. In speed tests, Murch read an amazing 8,000 words a minute, then took a test on the subject and scored 100.



Newest Diving Ball Is Underwater Copter

PROFESSOR Auguste Piccard uses both hands to sketch his latest invention—an underwater helicopter. He hopes to go down 6,000 feet into the sea with it. The two small props, powered by electric motors from within the machine, will propel the Mesoscaphe forward and backward.

Gus opened the hood and listened. The motor purred like a smooth-running sewing machine.

Gus Lends Luck a Hand

The tired old car and the tired old couple in it—somehow the Model Garageman had to put new life into both of them.

By Martin Bunn

GUS WILSON was under a car in the Model Garage, installing new bearings, when he saw Stan Hicks go out into the warm spring sunshine to wait on a customer at the pumps. Stan filled the gas tank and then cautiously removed the radiator cap, leaping back from a gush of steam that arose.

What an outfit, Gus thought—an old sedan, loaded to the windows with luggage that sagged the springs. It was a heavy load, but still the car wouldn't boil if it was in any sort of shape. Maybe he'd better go out and take a look.

About to Give Up

There was an old, gray-haired couple in the car. Gus leaned on the window ledge beside the driver and gave them a slow, welcoming smile.

"Nice day," he said. "Going far?"

"Going far!" the old man retorted. "We was. Clean to Colorado. Now we're turning back. Don't mind particularly myself, but hate to, because of Ma."

Gus looked at the thin, weary-faced woman beside the man, and his expression became concerned.

"That's too bad," he said. "How come you're turning back?"

"Well, it's this way," the old fellow said. "Name's Hodge—Sam Hodge. This is my wife, Mary. Me and Ma been running a farm downstate a way for forty years. It wasn't much of a place, but we ate regular. Then Ma here got sick, and Dr. Shumway reckoned we'd best go west so Ma could get well. We didn't have no money to start over in a new country, so we just set and figgered a while. Something will turn up, Ma tells me, and sure enough it does."

"You don't say," Gus said.

"That's right," the woman cut in. "I told Pa it would and it did. And I've been telling him that we don't have to turn back now. If our good luck got us started, and helped us to meet Mr. Clark and be offered that caretaking job, right where Dr. Shumway said we should go, it'll help us get there."

"Women," the old man said, getting out of the car and stretching his small, wiry frame, "are uncommon inclined to argue. We put the farm up for sale, had the car all fixed up, loaded our rigging and started out. Car's been a-b'ilin' ever since we started, and that's only a few hours back. What'll happen when we get into the mountains? Cost us over a hundred dollars to have the car fixed. We ain't got the money for no more of that kind of fixin', so I says we'd better turn back before we get stranded too fur to turn back."

Overhaul Didn't Work Out

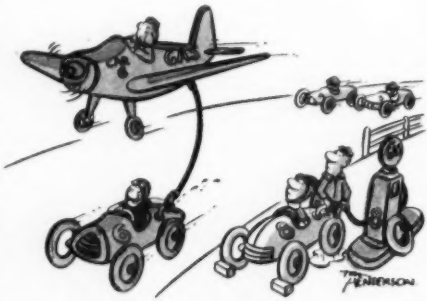
"You had the car all fixed up," Gus said. "Then why should it boil? Radiator must be clogged."

"Thought of that," the old man said wearily. "If it was only that we'd go on. Had it flushed and a new water pump put in, a piece back. 'Tain't that. Feller

that did my work back home just didn't do a job. Charged us for fixin' up the shaft, reboring the cylinders, putting in new rings and bearings, grinding the valves, and such. He charged, but guess he didn't do the work."

"That's a shame," Gus told him.

While Stan Hicks was collecting for the gas, Gus walked around to the rear of the car, stooped to peer into the exhaust pipe. The inside surfaces had that whitish, clean look that means good compression and clean firing. The motor started then, and as Gus moved up beside the driver he saw the old man twist the wheel as he shifted into gear, in preparation to turn around and head back the way he had come. The woman raised a protesting hand, then dropped it into her lap in resignation.



"Hold it, Mr. Hodge," Gus said quickly. "Mind if I listen to this motor a minute?"

"Go ahead and listen," the driver said. "Listenin' sure can't do no harm."

Gus opened the hood and listened. The motor purred like a smooth-running sewing machine. He leaned in through the open window and his eyes moved over the instrument panel. The speedometer showed 82,000 miles. He opened the door, reached in to depress the throttle, revving up the motor.

Gus Spots the Trouble

"Watch out," the old man said drily. "Some of the boxin'll fly out of her."

Gus's eyes halted on the oil-pressure gauge. The car, newly overhauled, with a reground shaft and new bearings should have held at 40 pounds of oil pressure at the speed the motor was turning over. It held at less than 10. Gus eased up on the throttle, and when the motor died to idle the pressure dropped until the oil-gauge needle was almost resting on the pin.

"This motor," he said flatly, "is in good shape, except that it doesn't have any oil pressure. Any motor will boil under load without oil pressure. Probably needs a new oil pump, or the screen's clogged. It's a quick job. I'll put in a rebuilt pump and check the screen for 10 dollars."

"Fellers all along the road been tellin' me things like that," Hodge said wearily. "A couple more quick jobs and we won't have the gas money to get home. I ain't strandin' Ma way off some place."

"You're the doctor," Gus said, shrugging his shoulders and turning away. He moved toward the garage, but he found that he couldn't so easily shake the look that he had seen in the woman's eyes. The car turned from the pumps, halted at the curb to wait for passing traffic. Gus moved back.

"I'll gamble on it, mister," he said to the old man. "I'll fix it or it won't cost you a penny."

A stubborn set came to Hodge's jaw. He shifted into gear, as if to move forward. Then, suddenly, his resistance crumbled.

"All right," he said, "I'll take you up on that. Your offer seems to be fair enough."

Gus put the car on the hoist, took off the oil pan with a spin wrench. It occurred to him that he was a fool. A clean exhaust pipe only indicated good valves and rings, clean firing. He hadn't heard knocking rods, but the mechanic who had overhauled the car could have put in new rod bearings and neglected the mains. Or he could have put in new mains on an out-of-round main shaft. Oil would spurt here as if from a leaky kettle.

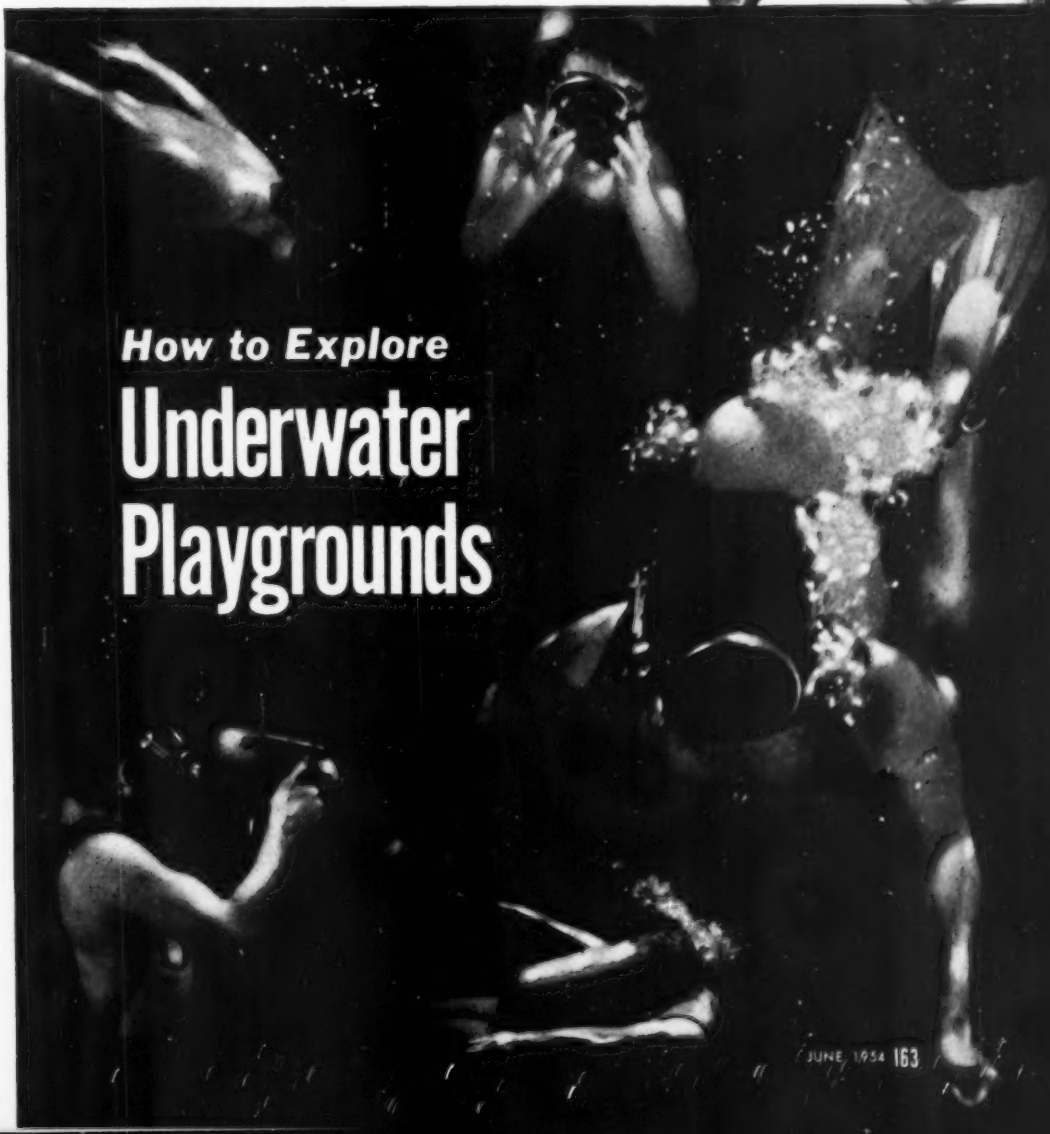
The oil-pump screen looked clear enough, but Gus wasn't taking any chances. He cleaned the screen and installed a rebuilt oil pump, poured the

[Continued on page 246]

America's fastest-growing sport

Few sports have increased in popularity with the speed of underwater swimming. To join the crowd on the bottom of the sea, you can spend a fortune on equipment (some of it is pictured on pages 174-175). Or you can get in the swim with homemade gear. Herb Pfister has built his own shallow-diving mask outfit, pump, snorkel, fins and look box. You'll find his directions on the next 10 pages.

PSM PHOTOS BY W. W. MORRIS



How to Explore Underwater Playgrounds

A $15 Diving Outfit That You Can Build

Most of the fun and beauty under water is at 15 or 20 feet. With this outfit you can breathe there as long as you like.

By Herb Pfister

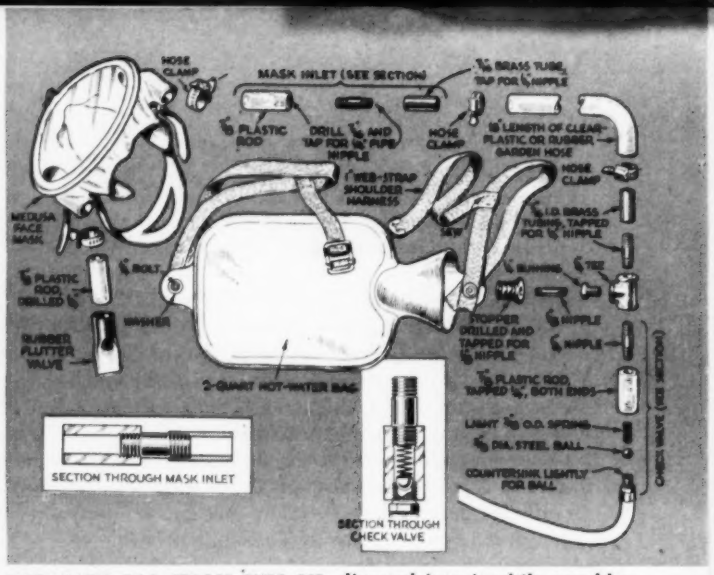
MOST people swim the hard way—splashing along on the surface, gulping air and struggling to keep their heads out of the water. Under the water with a diving outfit, or even a snorkel, you can relax. Your vision is clear when you peer through the glass plate of a face mask and you can enjoy all the interesting sights that surface swimmers never see. Add swim fins for moving effortlessly through the water

and you're set for the fast-growing sport of skin diving.

Despite its ridiculously low cost, the homemade mask diving outfit pictured below is as comfortable and as practical for shallow-water diving as the best of them. Breathing is easy and unrestricted (I even managed an underwater yawn), because the hot-water bag stores pure air while you exhale—air that would otherwise be wasted.

Safety is built in. It takes about 10 pounds of air pressure to keep your lungs expanded in 20 feet of water. Without it, the weight of the water around you would force your chest in, literally squeezing the air out of your lungs. A ball-check valve in the air line of this outfit keeps the air under pressure in your lungs, even if the air hose should break or be accidentally yanked off the pump fitting. In addition, the breathing bag will still retain one more lungful of air—enough to get you to the surface from 20 feet.

MEDUSA FACE MASK is most easily adapted to air hose. It can also be used for short dives while you hold your breath. The snorkels close under water.



HOT-WATER BAG STORES PURE AIR, diverted into it while you blow used air out through exhaust valve. Large-diameter hose between mask and bag lets you draw freely on this reserve, making it unnecessary to regulate your breathing to air coming down.

Start by converting a standard snorkel

WHEN you invade King Neptune's world, you've got to take a little of your own world with you—its atmosphere. With a face mask you can see clearly, but you've still got to breathe. An air hose hooked up to a face mask will bring air down to you from a pump or compressor on the surface, but then you'll need a breathing bag to make breathing easy and a check valve to keep the air from running back up to the surface. An exhaust valve is needed, too, to carry used air out into the water without letting water into the mask. Finally, you'll find it hard work to stay below without a weight belt to neutralize your natural buoyancy. All these things make a diving outfit.

Exhaust valve. This is easiest to make, so you might as well get it over with right off. Cut a 2" length of ⅞"-diameter clear-plastic rod and drill a ¼" hole through it. Dab some rubber cement on the end and slip a rubber flutter valve or novelty-shop noise-maker over it. Don't drill the rod larger than ¼" and don't use tubing instead, for water pressure might force the rubber valve into the bore, turning it inside out and letting water into the mask. Slip the valve into the snorkel socket on the left side of the mask, and secure it with a 1¾"-diameter hose clamp.

Air intake. Begin the intake line by drilling and tapping a 2" length of ⅞" plastic rod for a ¼" pipe nipple. Slip it into the right-side socket on the mask and lock it in place with a hose clamp. Thread a 2" piece of ½"-inside-diameter brass tubing to fit over the exposed end of the nipple already screwed into the plastic rod. Force one end of an 18" length of clear-plastic or light rubber garden hose over the brass tubing and clamp it with a 1" hose clamp. Make a similar arrangement of tubing threaded over a pipe nipple and slip this into the other end of the garden hose. Screw the exposed end of this nipple into a ¼" brass pipe tee.

Check valve. Screw a ¼" nipple into the opposite end of the tee and cut a 1¾" length of plastic rod for the check valve. Drill a 7/16" hole through the rod and thread both ends with a ¼" pipe tap. Screw the threaded rod onto the tee and insert a light ⅜"-diameter brass spring and a ⅜"-diameter steel ball in the opening. Close the open end of the rod with the standard ¼" air-hose fitting, countersinking its opening to form a seat for the ball.

Breathing bag. Use a 2-quart hot-water bag to capture and store the air coming from the pump while you are exhaling. Drill and tap the hard-rubber stopper for a short ⅛" pipe nipple and screw the nipple into a ⅛" to ¼" bushing set in the center leg of the brass tee. Fashion the shoulder harness from 1" web straps. Form a loop at each end of

DRILL AND TAP CLEAR-PLASTIC ROD with ¼" pipe tap (top). Then screw brass nipple into it and thread a sleeve of ½" brass tubing over nipple to fit into garden hose.

BRASS TEE joins breathing bag to air line. Drill and tap hard-rubber stopper and fit a ⅛" nipple in it. Screw nipple into bushing in tee. Use Permatex No. 1 on all threads.

mask for diving

the hot-water bag and stitch a short piece of strap to each loop to buckle across your chest.

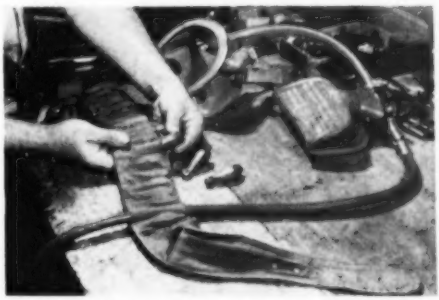
Weight belt. A 20-pocket shotgun ammunition belt makes a perfect weight belt. Fill all the pockets except one with 6-oz. fishing sinkers and run the air line (25′ of ⅜"-inside-diameter material hose) through the last pocket to relieve the mask of the shock of swimming out to the end of the air line.

After the outfit has been adjusted to your size, wrap rubber tape around the hose above and below the belt to keep it from slipping out of position.

Additional weights. If you find that the fishing sinkers are not heavy enough to neutralize your buoyancy in the water with the breathing bag filled, cast a few extra weights by melting sinkers and pouring them into a metal soap dish. When cool, remove these weights and fasten them to your weight belt with brass screws.

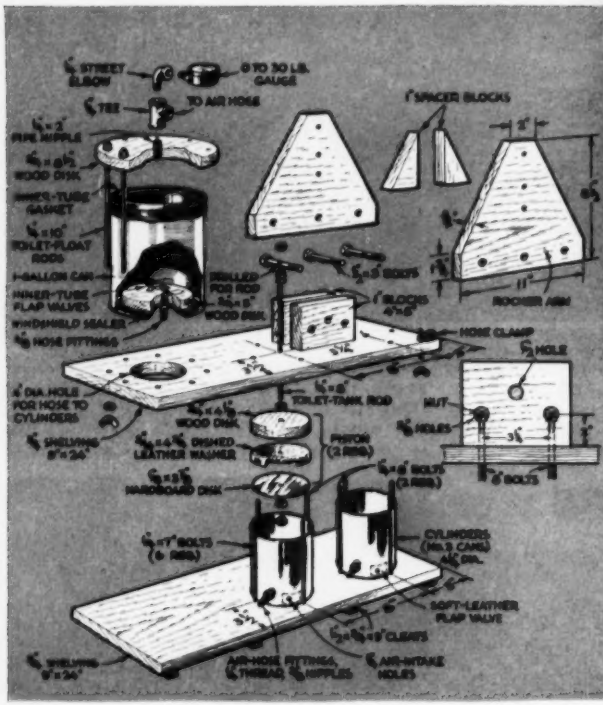
When you put the outfit on, pull the free ends of the belt and the harness through their buckles and loop them halfway back on themselves again. Thus, if you should want to get out of the outfit, all you have to do is yank on the ends to pull them loose. Actually, though, unless you're caught on something, it's better to leave the outfit on to retain your underwater vision.

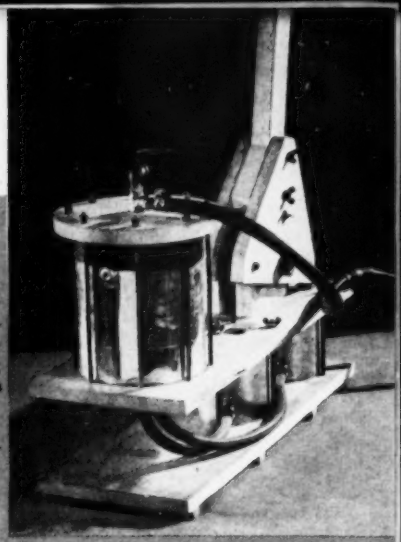
CHECK VALVE is steel ball housed in clear-plastic rod. Countersink end of air-hose fitting to form seat for ball. Light spring and ball are shown in foreground. Spring should be just long enough to let ball rattle loosely on seat. If too tight, it will restrict air flow.



WEIGHT BELT, made from shotgun ammo belt, holds lead sinkers and keeps the air line snug against waist. Shock of swimming out to end of hose is taken by belt, eliminating the possibility of fittings being yanked loose from the mask or breathing bag.

How to build the pump





PUMP DELIVERS about one cubic foot of air per minute and can build up to 20 lb. pressure. Soft leather flaps over holes in cylinders let air in on upstroke, then close over holes on compression stroke, forcing air into large can. Rubber flaps over holes in disk inside large can let compressed air in on each stroke of cylinders, then close over holes to retain it. Handle, not shown, is piece of 1" by 2", about 3' long.

THE surface pump, a masterpiece of tin-cannery, is as important as the rest of the outfit—it sustains you while you dive. Its tin-can cylinders and wooden rocker arms are not a makeshift assembly, but rather a deliberate utilization of common materials put together with simple tools.

Cylinders. With a can opener, cut the tops out of two #3 vegetable or fruit cans and file the ridge around the top edge smooth. Drill holes for the intake and hose fittings, and cement a flap of soft leather beside each intake hole. Solder a hose fitting to each can.

Pistons. Cut disks from scraps of shoemaker's leather for the piston plungers and soften them by rubbing with petroleum jelly. The softening can be hastened by soaking them in melted petroleum jelly kept warm over a low flame. Work them into a shallow dished shape and mount them on an 8" toilet-float rod sandwiched between a disk of wood and a disk of cardboard.

Accumulator can. Use a clean one-gallon paint can to equalize the pulse of the piston strokes and build up pressure for diving. New cans can be bought at paint stores for less than half a dollar. Air must come from the cylinders and accumulate in this can, so a set of one-way valves must be added to control the flow. Use rubber flaps about 1" wide by 2" long over holes drilled in a wood disk cut to fit inside the can.

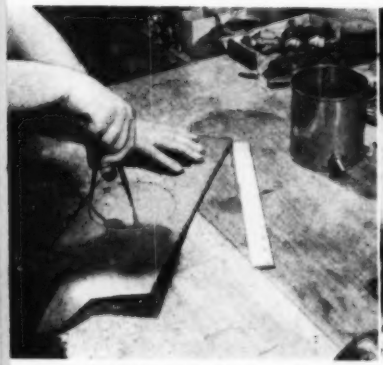
Assembly. Clamp the cylinders between two 9"-by-24" pieces of ¾" shelving, using long bolts to pull them together. Lock the accumulator can in place by eight toilet-float rods, which also pull a wood cover disk down tightly on the top of the can. Bolt the rocker-arm bearings in place and lock the piston push rods in the rocker-arm bolts. The push rods must be adjusted by raising or lowering the lock nuts so that the rocker-arm ends come down on leather buffers on the top board before the piston hits the air fittings near the bottom of the cylinders.

The pump requires no maintenance, but the leather plungers should be kept soft.

1 DRILL ¼" and 7/16" holes in side of each can ½" up from bottom for air intake and hose fitting. Remove burrs and smooth ridge around inside edge of can tops.

2 SOLDER AIR-HOSE FITTING in 7/16" hole, flowing solder generously on both inside and outside. Fittings, shown in foreground, are ¼" pipe thread with ⅜" nipple.

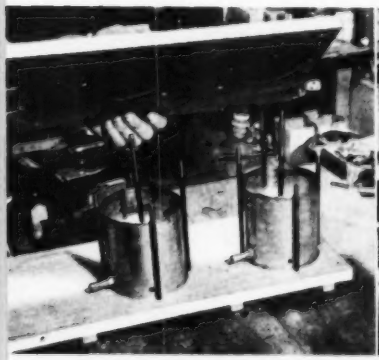
3 CEMENT SOFT LEATHER FLAP, ¾" by 1½", beside each intake hole, leaving about ⅓ of flap free over hole. Pliobond is ideal for joining leather to tin.



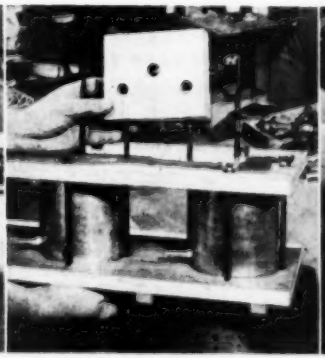
4 CUT DISK from piece of 3/16" shoe leather, about ½" larger than diameter of can. Score circle with pair of sharpened dividers until disk is cut through leather.

5 SOFTEN LEATHER DISK by rubbing well with petroleum jelly. When pliable, work the edge up into a shallow dished shape to form plunger. Drill a ¼" hole in center.

6 SANDWICH PLUNGER between 4⅛" disk of ¾" pine and 3⅞" disk of ⅛" hardboard. Try fit in cans, substituting larger hardboard disk for tighter fit.



7 FIT TOP BOARD over cylinders after inserting pistons. Grooves to fit top edges of cans can be scored with dividers, then deepened with narrow chisel.



8 MOUNT PIVOT BEARING for rocker arm on long bolts coming up from base. Lay nuts edgewise in holes and thread bolts into them. Other bearing is held by short bolts.

9 CUT ROCKER ARMS from ¾" pine. Drill ½" clearance holes in one arm and tap ½"-13 thread in 7/16" holes in other arm. Glue blocks on one arm to brace handle.

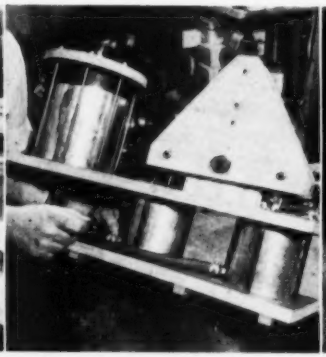
Please turn the page for more pump photos.

10 ASSEMBLE ROCKER ARMS on pivot bolt. Drill two outer bolts for ¼″ piston push rods and insert rods after screwing bolts in rockers. Adjust piston stroke with nuts on push rods.

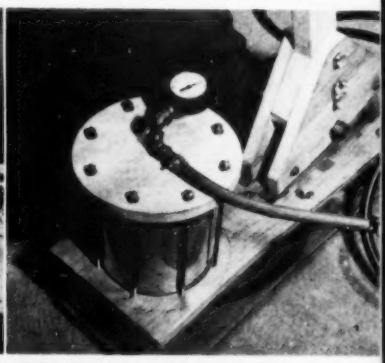
11 CEMENT RUBBER FLAPS over 7/16″ holes drilled in wood disk cut to fit inside large can. Tap these holes with a ¼″ pipe tap and drill mating holes in bottom of can.

12 SPREAD AUTO-TOP SEALER generously over the bottom of the wood disk and press it down on the bottom of the can. Screw two hose fittings into the wood disk.

13 HOLD THE CAN IN PLACE with eight 10″ toilet-float rods. These rods also pull the cover disk tight on the can. A band cut from inner tube makes an airtight seal.



14 CONNECT THE CYLINDERS to the large accumulator can with short lengths of ⅜″ hose. Drill a 7/16″ hole in the cover disk and tap it for a ¼″ pipe nipple in tee.



15 TWENTY POUNDS' PRESSURE shows on the gauge as the pump gets a test workout with the hose kinked. In use, only ½ lb. is needed for each foot under water.

YOU CAN USE A SMALL COMPRESSOR, a diaphragm type for oil-free air, and skip the hand pump. Fit out the mask exactly as shown for use with the hand pump and attach the air hose directly to the compressor. Excess air will blow out.

Where to Get What You Need

Medusa mask: Aqua-Gun Co., 1120 N. B'way, Yonkers, N.Y., or Abercrombie & Fitch Co., 45th St. and Madison Ave., NYC.

Material hose: Eastern Auto Stores, 25 School St., Glen Cove, N.Y., or Sears, Roebuck.

Hose fittings, clamps and pipe nipples: same as above.

Shotgun ammo belt: Lemp's Rod & Gun Shop, 9 West Glen St., Glen Cove, N.Y., or most rod-and-gun shops.

Toilet-float rods: any hardware or plumbing-supply store.

Clear-plastic rod: Berton Plastics, 585 Sixth Ave., NYC, or most hobby-and-craft shops.

Rubber flutter valve: Abercrombie & Fitch Co., or use novelty-shop rubber noisemaker.

How to use your outfit

DIVING is like driving—once you know how, you can really enjoy it. Try your first dive in shallow water about neck deep to get accustomed to the outfit. Roll around to see how the breathing bag functions in different positions. You'll find a swimming position is best, as the bag is higher in the water than the exhaust valve. Standing erect or rolling over on your back puts the bag lower than the exhaust valve and the slightly greater water pressure flattens it, forcing your air reserve out the exhaust valve.

Take your next dive in water that you know is about 20 feet deep. A good idea for all your dives is to suspend a brightly colored weight in the water on a 20-foot line; that way you'll always know your depth.

The ¾" hose will float, so there's no need to worry about it getting snagged on the bottom. Just throw all the hose into the water and take what you need down with you. Watch your hose, though, for kinks. As you swim around, it will coil loosely. Then, if you should swim out and pull it taut, those coils may tighten into kinks that stop the flow of air. Should this happen, swim quickly toward the hose and the kinks will loosen. Pressure that built up in the accumulator tank will then surge down to you, filling the bag and your lungs.

Going down, at about eight or 10 feet, you may feel pain in your ears. Normally, your ears will pop themselves clear, but sometimes a bit of coaxing is needed. Stop descending when pain is felt and rise a foot or two, working your tongue and swallowing. This should open the tubes and, once cleared, they'll continue to equalize themselves on the way down. If your head is congested from a head cold, give it up for the day or limit yourself to cruising just beneath the surface. Don't use ear plugs—they'll do more harm than good.

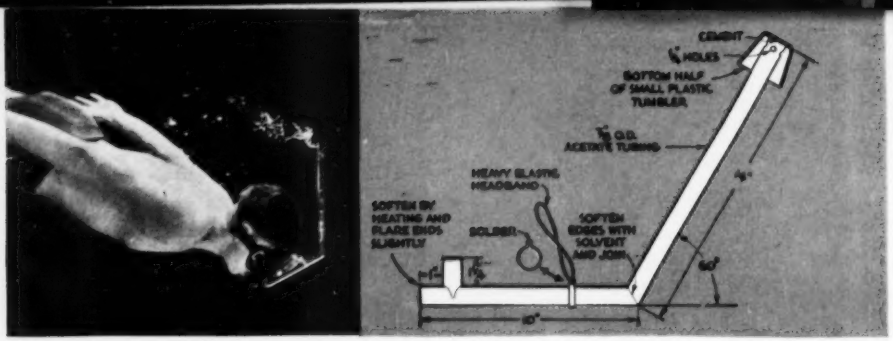
WATCH THE AIR LINE. Swimming in circles can coil the hose above you. Then, when you swim out to its limit, the coils tighten into kinks. Try to swim in figure 8's to avoid this.

Tips for your pump tender

YOUR pump tender must be a conscientious fellow. No great strength is needed to man the pump, but a certain amount of attention must be given to the job. Brief him before you go down so he'll know what's expected of him. The pressure gauge on the accumulator tank tells him how you're doing below. When you're 10 feet down, the gauge should show about five lb. pressure.

If your air line should kink, it will show at once by a higher-than-normal reading on the gauge. The tender should continue pumping until about 20 lb. has built up in the tank. By that time you'll have discovered your plight and slacked off on the hose to loosen the kink. Pressure will then drop to what it was before the line kinked and the tender should continue pumping normally. A steady 60 full strokes (out and back on the handle) per minute will give you plenty of air, but as you go lower (as indicated by a gradual increase in gauge pressure) the tender should pump a bit faster and make sure that he's taking the full stroke to give you the last punch of air from the cylinders.

A good idea, too, is to have someone watching you on the surface through a look box. This way, if you do get into trouble, help can come at once.



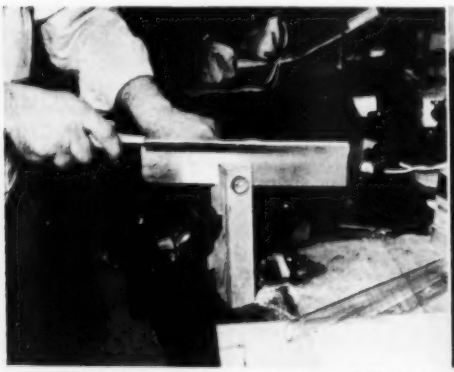
Build your own snorkel

WEARING a face mask, you can *peek* into the watery wonderland, lifting your head every half-minute or so for air. But with a snorkel to reach above the surface for your air, you can quietly swim or float face down and breathe normally for hours.

The snorkel is made from three pieces of acetate tubing, joined with acetone or ethylene dichloride. Draw the snorkel full size on a sheet of paper tacked to a flat board. Nail strips of wood along the lines to make a jig for joining the parts. Cement half of a small plastic tumbler to the top of the snorkel to trap air and hold back water when you dive.

Using a snorkel is no trick at all. Just cruise along the surface with the top of the tube projecting out of the water. If something below interests you, take a deep breath, hold it and dive. When you return to the surface, exhale vigorously to blow through the flutter valve any water that may have entered tube. Practice in shallow water and learn to clear tube with one puff.

Acetate tubing and solvent can be obtained from Berton Plastics, 585 Sixth Ave., NYC; mouthpieces from Aqua-Gun Co., 1120 N. Broadway, Yonkers, N.Y.; flutter valves from Abercrombie & Fitch Co., 45th St. and Madison Ave., NYC.



CUT TUBING by inserting it in hole drilled in block of wood. Angle of cut is marked on top of block, which is used like a miter box.

FIT MOUTHPIECE TUBE to snorkel body by rubbing it on medium sandpaper wrapped around piece of scrap tube.

JOIN PARTS in jig laid out on flat board. Soften edges in solvent and press them firmly together for several minutes. Drill hole for mouthpiece tube *after* cementing it to body. Drill holes around top before adding cap.

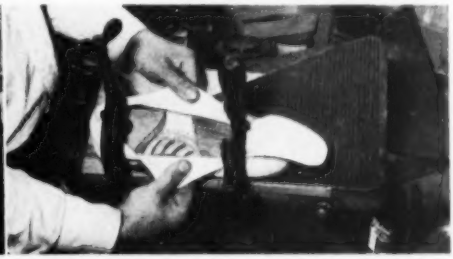
SOFTEN BOTTOM OF TUBE by heating and press it lightly against bench to flare end for rubber flutter valve. Slip valve and mouthpiece (foreground) on snorkel and bend brass strip to form ring for elastic headband.

How to make your fins

WHETHER you're a novice or expert, swim fins will add thrust to your kicks. An easily made pair that will open your eyes to the possibilities in these kickers can be made by cementing rubber flippers to a pair of rubber-soled tennis shoes. Fins can be flexible, like these, or as stiff as a board. The stiff kind really push you through the water, but great leg power is needed to use them.

CUT FLIPPERS from heavy auto mat. Inside edge of flipper runs parallel with foot. Outside edge starts even with heel and tapers out to about 10" across the front edge, resembling a large 30°-60° triangle with rounded corners instead of points. Trace outline of soles on flippers and rub soles and meeting area of flippers with coarse sandpaper.

APPLY TWO COATS OF PLIOBOND to soles and flippers, wait a few minutes for it to get tacky and press tennis shoes on flippers. Insert blocks of wood cut to fit in shoes.



USE CLAMPS on blocks to press shoes flat and let cement dry for 24 hours. Short lengths of garden hose, slit along one edge, can be cemented over edges of flippers for stiffness.

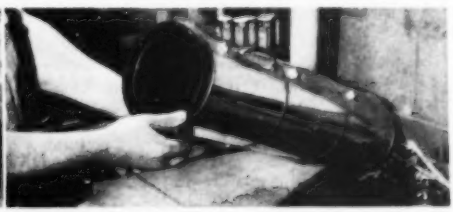
How to make your look box

PEEP into the briny without getting wet with this look box made from three one-gallon paint cans soldered together. Dip it an inch or so into the water to eliminate reflections; you'll see as clearly as a diver.

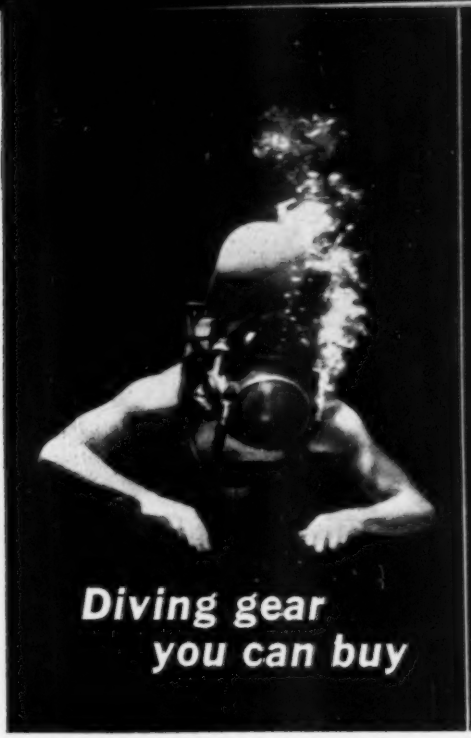
Cut the bottoms out of the paint cans and join them with tinning solder flowed on with a hot iron. Fit a clear-plastic disk in the bottom, add handles, and cement sponge rubber around the top to protect your face.

CUT BOTTOM CAN with circle cutter rotated by hand to leave 1" flange for attaching window. Use can opener on other cans to remove bottoms completely. Drill 12 holes in flange and ¼"-thick plastic disk for screws.

USE BRASS SCREWS AND NUTS to fasten window on flange. Apply auto-top sealer to the flange before attaching window.



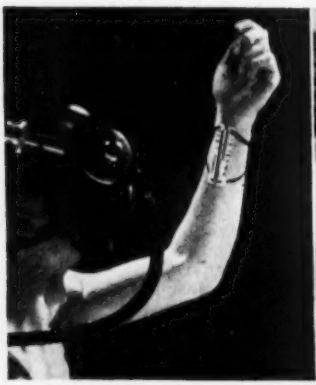
CEMENT A SPONGE-RUBBER STRIP around the top can to protect your face against the look box's bobbing on the water's surface.



Diving gear you can buy

1. HYDRO-PAK IS NEW. Air is supplied to a full-face mask with safety-glass window, providing easy, natural breathing. The demand valve has a button for shooting air into the mask to blow out water. Snorkel conserves tank air while on surface. A regulator reduces pressure and a reserve valve cuts in last ¼-tankful of air. Price: about $250.

2. AQUA-LUNG has been used by skin divers for many years. Air is drawn through a mouthpiece linked to a demand valve by two hoses. Separate mask is used for seeing underwater. Demand valve has a regulator to reduce tank pressure, and a rod-actuated valve cuts in reserve air. Both units use compressed air, not oxygen. Price is $160.



4. KNOW YOUR DEPTH at all times with this easy-to-read plastic depth gauge you wear on your wrist. As pressure increases, water enters a tube which is read like a thermometer. It sells for about $3.50.

5. TIME YOUR DIVES with your own watch tucked into this watertight watch case. The price is $10.50 without watch. It is needed to allow ample time in coming to the surface from deep dives.

6. LIFE PRESERVER will float a 250-lb. man. Packed no larger than a pack of cigarettes, it inflates instantly when squeezed. The price is $2. It is the only life preserver a diver can wear under water.

Further information on these diving outfits and accessories can be obtained from: 1. Scott Aviation Corp., 8300 Erie St., Lancaster, N. Y.; 2. U. S. Divers Co., 1045 Broxton Ave., W. Los Angeles, Calif.; 3. Fenjohn Underwater Photo and Equipment

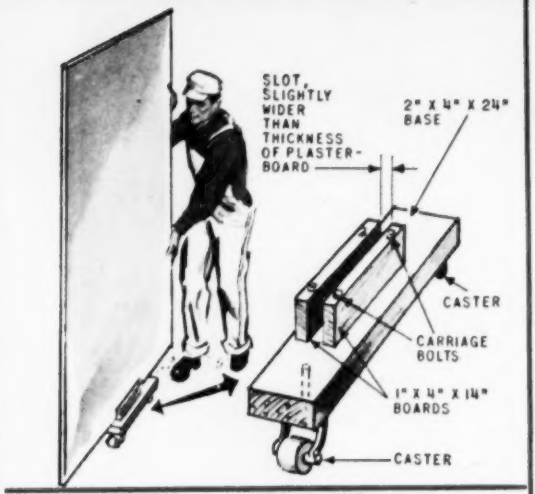
3. UNDERWATER CAMERAS. Anything from a Brownie snapshot to professional 16-mm. movies can be taken in 15 or 20 feet of clear water without additional light. The camera above takes 2¼"-by-2¼" still photos. Controls for lens, shutter and film wind are outside the watertight housing. Price is $675. The synchronized underwater flash gun is an extra. For $29.95 you can capture underwater sights on film with a box Brownie fitted in a clear-plastic box (top photo). For the man in the chips, the 16-mm. movie camera in the lower photo is an electrically driven job priced at $1,990. A nest of 18 flashlight batteries powers the motor. Camera is controlled by knobs on the outside.

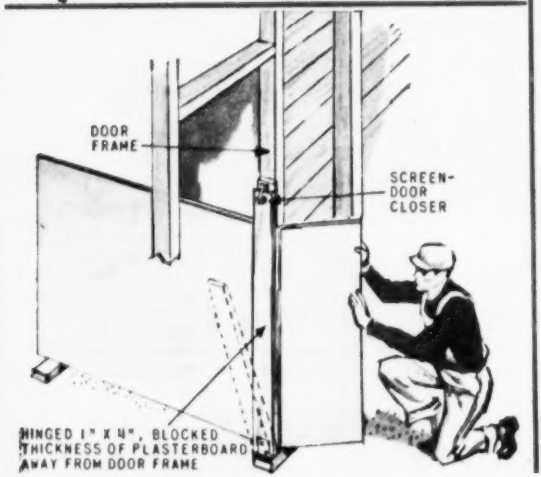
7. DIVING VEST keeps the Aqua-Lung or Hydro-Pak tank snug against your back for easier swimming. A quick-exit zipper frees the vest in a flash. It comes in one size, with side adjustments, at $25.

8. SNORKEL FOR AQUA-LUNG conserves air when you swim on the surface, is a necessity when you swim back to base with empty air tanks. It replaces the old mouthpiece on a breathing hose ($15.50).

9. SEE EVERYTHING CLEARLY, if you wear glasses, by having your optician mount your prescription lenses in this plastic eyeglass adapter. It fits snugly against window of Squale mask. Price: $3.50. END

Corp., 90 Cricket Ave., Ardmore, Pa.; 4. Abercrombie & Fitch Co., 45 St. and Madison Ave., NYC; 5 to 9. Fenjohn Corp. or Abercrombie & Fitch Co.





Two Useful Tips for Handling Plasterboard

If you build or remodel with plasterboard, a special dolly will make it easier to move the unwieldy sheets from the stockpile to the place where they will be put up.

Mount a pair of furniture casters under a 24" piece of two-by-four. Then nail or bolt two one-by-fours on edge to the top surface, spacing them a little farther apart than the thickness of the plasterboard. Rest the panel in the slot while moving it.

An easily made jig will speed up the job of scoring and breaking that is required to fit the panels.

Locate a plumb doorway frame with room on either side for a full sheet of plasterboard. Nail a block temporarily to the floor, snugging it up against one side of the door frame. Select a 50" piece of one-by-four with a perfectly true edge and hinge one end of it to the floor block ½" away from the door frame (the thickness of the plasterboard).

Swing up the one-by-four against the door frame and attach a screen-door closer to hold it there and provide tension against the plasterboard after the panel is inserted in the scoring jig.

After scoring the panel along the straightedge, apply hand pressure and a clean break will result.

Then pull the panel a few inches farther through the jig to cut the paper behind the break in the plasterboard.—*W. G. Waggoner, Sacramento, Calif.*

Smooth Sandpaper Works Better

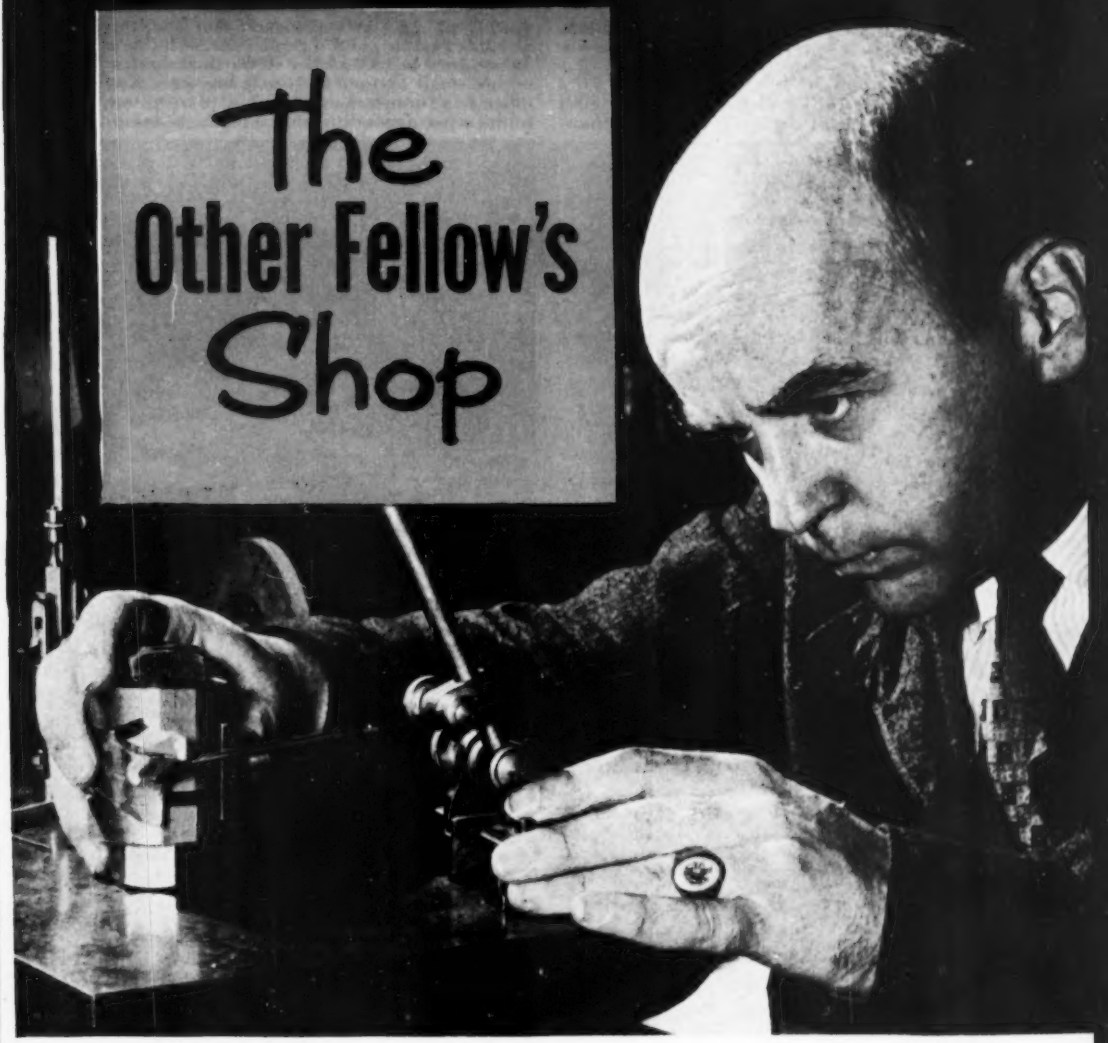
Most sandpaper has a few larger grains in the surface that quickly collect paint and build up high spots, preventing the rest of the paper from touching the work and often causing scratches.

If you keep chipping off these spots as they appear, the result will be a much faster and smoother sanding job.—*Clinton R. Hull, Costa Mesa, Calif.*

Inner Tube Makes Small Pool

Our 18-month-old was a bit young for the bigger wading pools, so we decided to start him out in this small splash-size one made from an inflated inner tube. For a watertight bottom, I cemented a sheet of plastic from an old furniture cover to one side of the tube, then covered this on both sides with fabric to prevent wear.—*Daniel L. Weaver, Cleveland, Ohio.*

The Other Fellow's Shop



Winthrop Johns started designing new tools in his basement shop. Now his former hobby keeps a small factory humming.

By George H. Waltz Jr.

MOST of us like to boast about how big our home workshops are and how they've grown from year to year. But Winthrop Johns of Plainfield, N. J., points with pride to the fact that his home shop has grown smaller!

Four years ago, Win Johns' shop was not unusual. He had so much equipment crammed into his basement that you almost had to edge in sideways to clear the machines. He had a machine lathe, a standing drill press, a

high-temperature brazing furnace, a planer-jointer, a homemade circular saw.

Now he has only one small bench, a saw and a planer-jointer in his basement—and seldom uses them for anything except minor repairs.

Where did all the rest of his stuff go?

Down the road a half-dozen miles to a former small truck terminal.

Why?

Because Win Johns' hobby became his business. He now devotes every day to it and has several helpers.

Win Johns had not built a better mousetrap—although he has some pretty definite ideas about that—but he had recognized some unfilled needs of other home workshoppers, and he's now in the business of filling those needs.

Johns started to build up a home workshop as a hobby during World War II when, just a few years out of Massachusetts Institute of Technology, he was a design and production engineer for a diesel-engine company in New Brunswick, N.J. His first motorized tool was the homemade circular saw that he still has. He rigged it up out of an old washing-machine motor and a grinding-wheel arbor. After a day spent wrestling with engineering problems at the diesel shop he liked to go home and putter around.

But he never seemed to have the right size and kind of dowels on hand. He liked to use dowels of the same wood as the work. To solve the problem, he designed and built a simple dowel maker—a sort of overgrown pencil sharpener that would whittle wood scraps held in the chuck of a lathe or drill press down to dowel lengths of the desired diameter.

That simple new idea started the transformation of his shop into a small factory. When the war ended and military produc-

More Americans are spending more time and money on home workshops every day. There's more variety in these shops than in TV shows, and a man's shop is often the most novel and interesting part of his home.

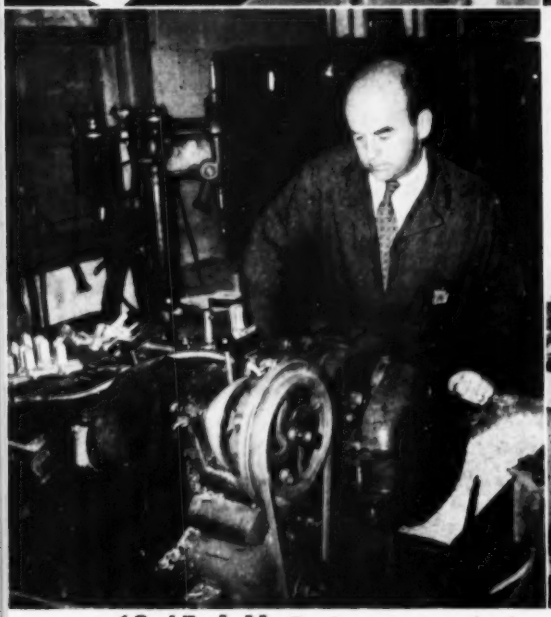
This is the second of a series of articles about outstanding home workshops, from which everyone who has a shop may pick up a few helpful pointers.

See POPULAR SCIENCE MONTHLY *next month for a story on another fellow's shop.*

8:30 A.M. **After an early-morning stop at the post office, Winthrop Johns goes to one of the desks in the office of his small factory and sorts his mail. The office has four desks and he shifts from one to the other depending on the job he is doing.**

10:30 A.M. **With office duties out of the way, Johns and his one full-time employee take time out for a coffee break in the factory's combination kitchen and chemistry lab. During this period Johns reads up on advertising and merchandising.**

9 A.M. Johns confers with his part-time Girl Friday who serves as shipping, mail and file clerk. The stock bins in the background used to line the walls of his basement home workshop where he started his business. Photo at right shows three products of the Johns Mfg. Co.: carbide-tipped wood-turning tools, a dowel maker and an acid-neutralizing oil-drain plug for automobiles. His own toolmaker, Johns at times contracts to make carbide-tipped production tools for other plants in the neighborhood.



10:45 A.M. To keep up production, Johns dons a work coat and helps out his hired hand by taking a turn at the lathe, putting the finishing touches on some dowel makers. The lathe and drill press are part of his original basement workshop.

11:30 A.M. Johns explains the workings of his brazing furnace to his helper. It is used for silver-brazing tungsten-carbide tips in place on woodworking tools. This furnace also once stood in his workshop. *(Please turn the page.)*

8 P.M. **Each night, Mrs. Johns types out the mailing labels for the orders received during the day. She also handles a great deal of the Johns Mfg. Co.'s correspondence. With three children to take care of, it makes a full day for her, too.**

WHERE IT ALL BEGAN—the basement of the Johns home. Win's home workshop now consists of just a bench, his original homemade circular saw (foreground), and a planer-jointer. His family sees to it that he keeps his hand in with repairs on furniture and toys.

tion was cut back, Johns placed three small seven-line ads in POPULAR SCIENCE MONTHLY describing his dowel maker. The response was so encouraging that he made arrangements to have the main body of his dowel cutter cast in a local casting shop and invested $202 in a secondhand metal lathe and a drill press to do the finishing work.

In three months, he made, hand-assembled, and sold close to 500 of his dowel makers. After a full day of manufacturing, Johns, with the help of his wife when the children were bedded down, would shift to another cramped corner of the basement set aside as the shipping department.

Carbide Tips for Wood-Turning Tools

Then he had another idea. The one thing, he reasoned, that takes some of the fun out of wood turning is keeping the tools sharp. Why not produce wood-turning tools with tungsten-carbide inserts—tools that would hold their edges almost indefinitely? Tests convinced Johns that he could make them at an attractive price. The main trick was in silver-brazing the carbide tips in place.

By May, 1947, Win was in full basement production—turning out a series of 10 tungsten-carbide-tipped wood-turning tools as well as the dowel maker. To meet demands, he finally had to rent space in a nearby machine shop.

Then he turned to another pet idea. While working for the diesel company he had become interested in the basic causes of engine wear. Experiments had shown him that engines running at high temperatures operated cleaner and with less wear. Heat, he reckoned, cooked off moisture in the engine. Since water itself isn't too harmful he decided that there must be something in the water—perhaps acids—that helped to cause engine wear and damage. So he looked for ways to neutralize acids.

His Own Car Serves as Test Lab

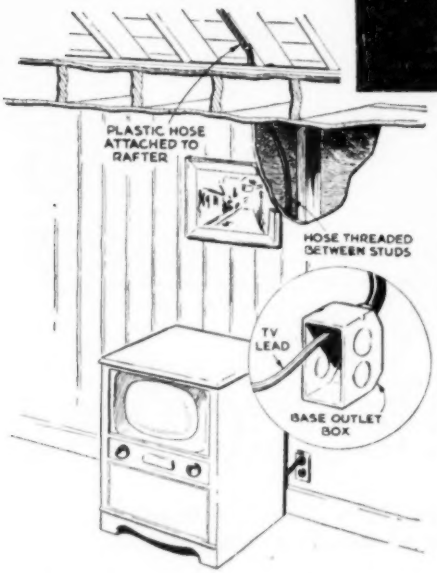
Using his new Ford as a guinea pig, he began dropping pellets of potassium hydroxide (a second cousin to lye) into the oil in the crankcase. But the potassium hydroxide was so strong a base that it began to eat away the engine's timing gears and other aluminum parts.

He thought then of putting some metal that is easily attacked by acids—such as magnesium or aluminum—into the crankcase so that any acids present would attack

[Continued on page 268]

Spot Gardening Cuts the Cost

SOIL-CONDITIONING chemicals are expensive if you spread them at random over a wide area. But you can save a lot, says the U.S. Department of Agriculture, if you place the chemicals in small, individual hills just big enough for each plant. Large-rooted vegetables like tomatoes and cabbages need a hill 18″ to 24″ wide, smaller plants as little as 12″. A sifter makes a good spreader, then mix the soil to a depth of 6″ and wait a day or so before planting.



Plastic Hose Takes TV Antenna

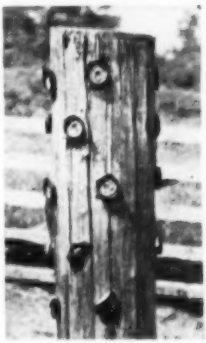
WHILE building a home, one person I know ran several lengths of plastic garden hose from the attic down through the wall to electric outlet boxes behind possible locations for a TV set. Now he is ready for practically any type of antenna that he might want to use in the future. The inside of the hose makes it easy to feed the antenna through the lead.—*B. C. Vaughan Jr., Springdale, Ark.*

Glue Helps Toughen Photograph-Mailers

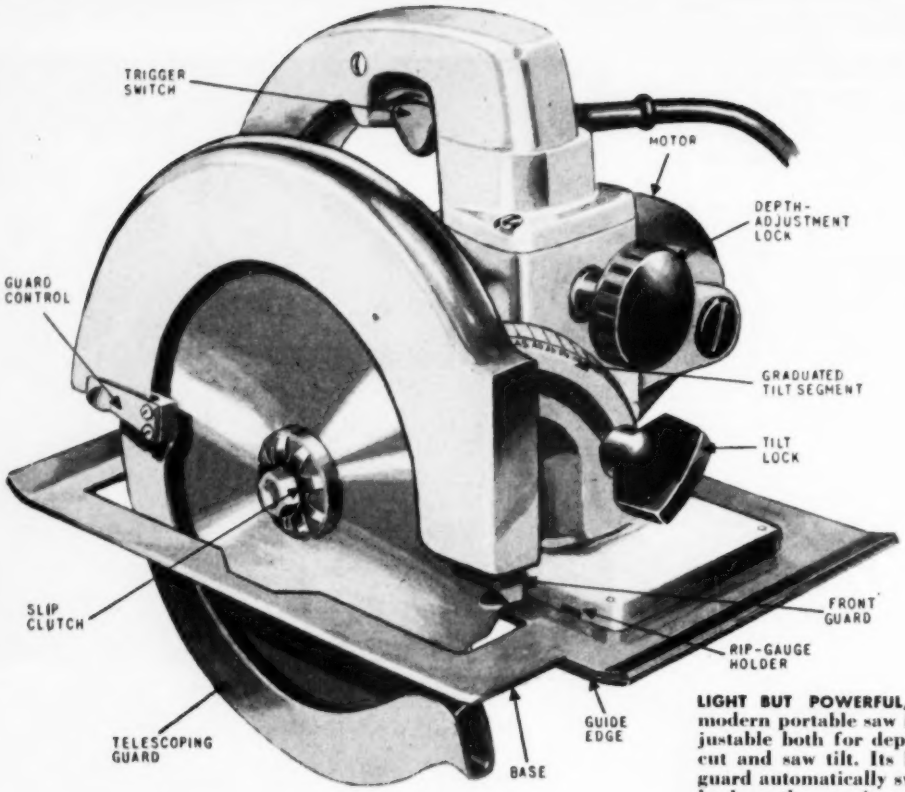
CORRUGATED-BOARD stiffeners used to mail photographs won't become crushed and dog-eared if you first reinforce the corners like this.

Dip them in liquid household glue, which has been slightly diluted with water and heated to increase its penetration qualities.—*O. A. Nelson, Seattle, Wash.*

Look! It's a Back-Scratcher



BOTTLE caps nailed to a stout post with their rough edges outward give cattle a place to scratch their itching backs on Walter Wiewal's dairy farm near Groton, Mass. He recommends using long roofing nails so the caps won't pull out. The caps are spaced 6″ apart.—*C. L. Stratton, Hollis, N.H.*



LIGHT BUT POWERFUL, the modern portable saw is adjustable both for depth of cut and saw tilt. Its blade guard automatically swings back as the saw is pushed against the work. The cord has a ground clamp in addition to the usual plug.

Facts and Pointers on Portable Electric Saws

Speedy and versatile, these tools go right along on the job, providing tireless energy for dozens of woodworking chores.

By Maurice H. Reid

From the book, How to Use Portable Power Tools
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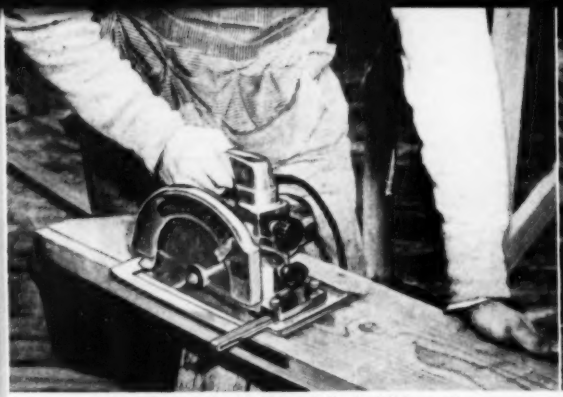
THE portable electric saw is a great time saver—one model will cut a one-by-ten plank in half a second. In cutting joists, studs and rafters, one man with a portable saw can easily do the work of 10. With a little practice, the average person can operate it with greater accuracy and ease than a skilled workman can use his handsaw.

Which saw do you need? The size is rated by the diameter of the circular blade, from the small 4″ up to the heavy-duty 10″ and 12″ blades used for construction work. The little 6″ saw will cut up to 2″ in depth. Since standard two-by-fours are 1¾″ thick, this saw will handle such pieces nicely. Its 45° bevel cut, however, will not quite reach through a two-by-four. For light framing, general house building and repairs, and for workshop use, the 7½″ or 8″ saw



A PLANK IS RIPPED while held lengthwise on a sawhorse, with the cutting line at the worker's right. His left hand holds the plank. The rip guide, set to the desired width from the right-hand edge, gauges the cut.

COMPOUND MITER CUTS slant two ways—the blade is tilted, and the cut is at less than 90° to the edge. Mark out the long side on top, for the saw tilts inward below. Guide it against a gauge (shown) or a clamped-on board.

will therefore be better suited to the job.

The drawing on the facing page shows the features of such a saw. A highly desirable feature is the kickproof clutch. A spring washer under the blade-retaining nut allows the blade to slip on the arbor if it binds in the cut, letting the motor turn even if the blade is locked.

This smooths out the drive action, relieving motor strain and lessening the risk of overloading. It also protects the user from possible kickback of the work.

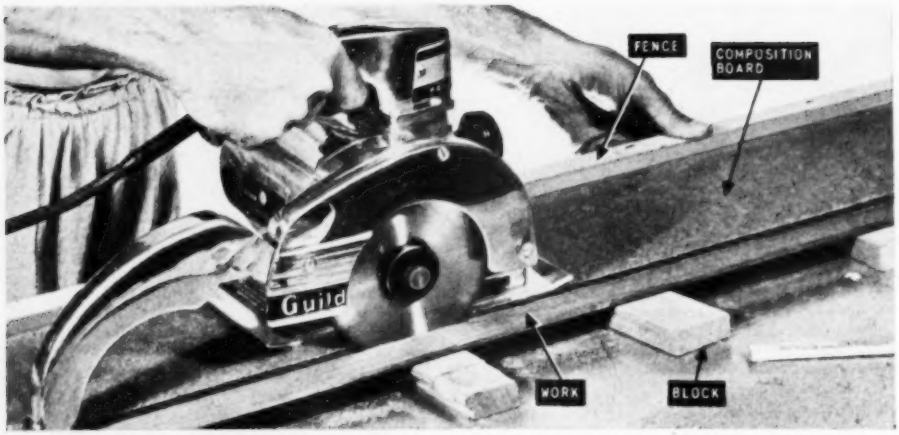
How to use portable saws. The electric saw is a right-hand tool and is used much like the handsaw. But the cut is made from the near to the far edge and from the underside of the work toward the top. Hold the saw with the right hand and the work with the left. Make sure that the work is safely supported. The ideal height is about midway between knees and hips, or just below the hips. You should be able to move the saw the width of the board without stretching.

When working up to about 35 feet from the outlet, you can connect the machine cord to a floor outlet or an extension of No. 14 wire. For greater distances, use No. 12 or No. 10 wire connected at the fuse box. Inadequate wiring creates excessive voltage drop that can cause motor failure.

Be sure that the ground-wire clip on the motor cord is connected to a good ground on clean metal. This can be a water pipe, electrical conduit or BX cable, or a pipe or rod driven into the ground. [Such grounding is your best protection against possible shock.—Ed.] Keep the inlet and outlet air passages on the saw free of sawdust to keep the machine running cool.

Sawhorses make good work supports and

TO MAKE POCKET CUTS inside a floor or wall, set the saw down near one corner with the front of its base on the wood, the guard held back and the blade on the waste side of the line. With the blade raised slightly, start the motor and lower the saw into the wood until it is down flat. Back up to the near corner first; then cut forward to the opposite one. Repeat for each side. Since the round blade cannot cut the corners out square, finish them with a keyhole saw or handsaw.



A PRECISE RIPPING GUIDE for long work consists of a piece of composition board with a wood strip nailed along one edge. The left edge of the saw base guides along the strip. As the first saw pass cuts the right-hand edge of the composition board, this edge can thereafter be used to set guide on the rip line. Blocks under work prevent cutting into table.

are about the right height. Place them far enough apart so that the material rests solidly without tilting, and with one of the horses close to the left of the line of cut. Be careful to leave clearance for the blade to cut without sawing the support.

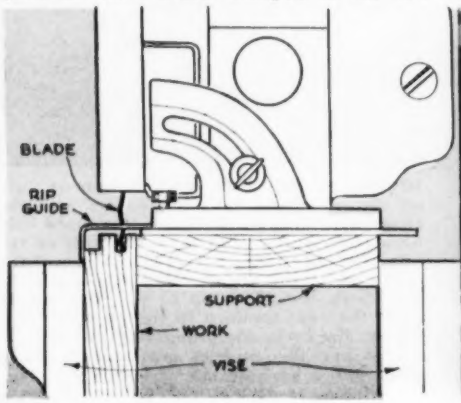
When plywood or other light material is sawed, place the stock on a table with scraps of one-by-two under it, spacing these so that the work does not sag. Set the blade depth to cut just through the material.

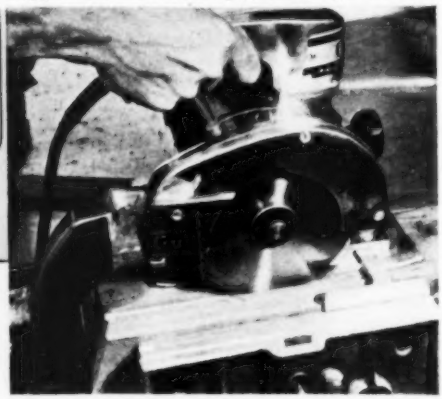
Crosscutting operations. Crosscutting can be done with the combination blade for ordinary work, with a crosscut blade for a cleaner cut, or with a planer blade if a really smooth edge is desired. Be sure the blade is sharp, and set the depth so that it cuts just through the work.

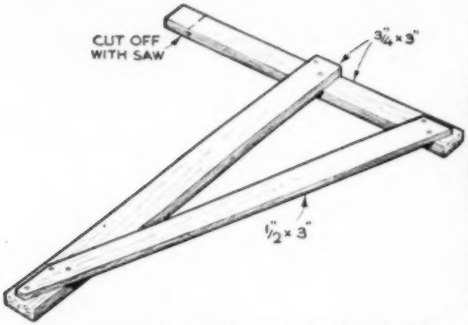
Whenever possible, place the board to be cut so that the mark is at the right of the support. Lay out the work so that the base plate of the saw will ride on the supported side of the material. Rest the front of the saw base on the work, the cutting line aligned with the guiding edge of the base. With the blade well back of the work, start the motor and let the blade come up to full speed.

Advance the saw steadily, following the cutting mark with the edge of the base plate. At the end of the cut, release the trigger switch and follow straight through

EDGE CUTS for rabbets, tongues or grooves require an extra board clamped in the vise alongside the work, exactly flush with it, to support the saw. The rip guide gauges the cut.







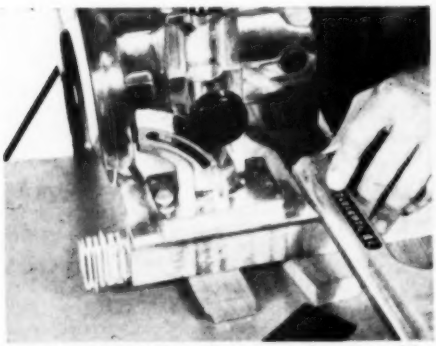
A BIG SQUARE for cutting plywood and wallboard accurately can be made from a 6' length of one-by-three with a smooth, straight edge. Use a framing square as in the top photo at right to nail it at 90° to a base piece that extends past it about a foot. Brace with a light strip; then saw off the base as in the lower photo. Set end where work is to be cut.

until the blade is clear. Then lift the machine out and away from the work. Do not let the blade keep running or twist the saw at the end of the cut, or the work may be scored. To prevent jamming or binding of the blade as you reach the center of a wide board, insert a screwdriver or small wedge at the starting end of the kerf.

Freehand cutting is quite easy and can be very accurate. Let the saw balance itself in the hand. Get to know the feel required to keep the blade cutting. Never push or force it into the work. Let the saw do the cutting, while you merely guide it.

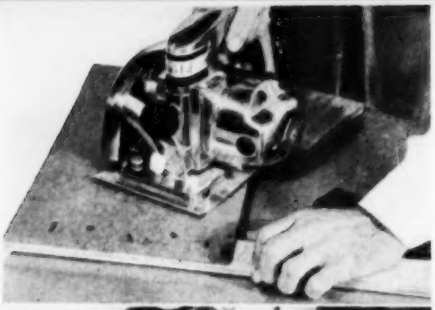
Ripsawing. Ripping can be done with the combination blade or the ripping blade. The latter will give a smoother edge. Adjust the blade depth slightly more than for crosscutting. Then attach the rip gauge and set it at the required distance to the blade.

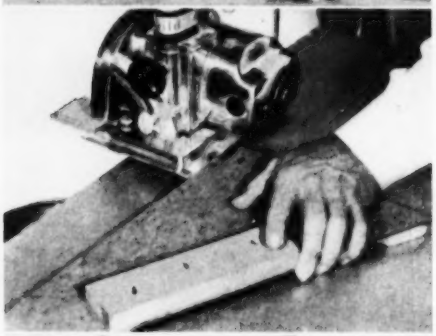
Generally, a slightly different arrangement for holding the work will be needed in ripping. One must be careful not to cut toward the sawhorse or other support. Ripping a wide board presents few difficulties because there is ample support for the saw and a good hold for the left hand. Run the

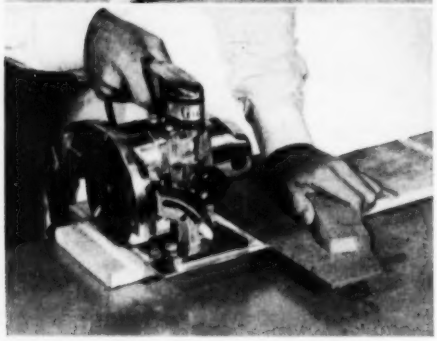


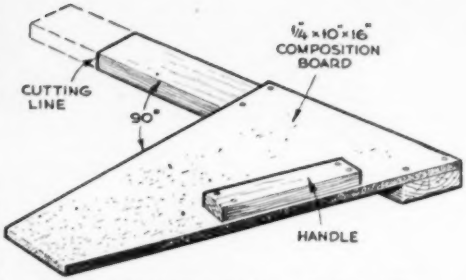
TENONS ARE CUT with repeated passes like this. Make the shoulder cuts at the bottom of the tenon first, guiding against a square. Then cut kerfs to the end, leaving a little wood between them. Pare ridges with a chisel.

FOR DADOES, use a square or a clamped straightedge. Cut to the dado lines first. Remove waste with repeated passes, leaving 1/16" of wood between them. Chisel out the rest. Smooth with sandpaper-wrapped block.









HANDY CUTOFF SQUARE is made by nailing a length of wood to a piece of composition board. Saw outside to an angle as in top photo, nail on a short piece as a handle and cut projecting part of base off as in center photo. Align cut end with mark on work.

cut out to the limit of a reasonable reach. Release the trigger, but be careful that the saw is not moved. Then slide the board toward you so that the cut can be extended farther, and insert a small wedge in the cut to hold it open.

Of particular importance in ripsawing is the width of the cut made by the blade. The blade will remove material to a width about twice its own thickness. This loss of material can be disastrous if the cut should be made on the wrong side of the line; the resulting piece of lumber would be narrow by 3/16". When ripping a piece of wood, be sure that the cut is on the waste side.

Bevel sawing. The depth of cut possible with the saw tilted at an angle is not as great as with a straight cut. When working at near-capacity limits, check the thickness first to make sure that the cut can be made in one pass. If it cannot, it may be best to decrease the depth so that about half the necessary depth is cut on the first pass. Then you can turn the piece over and complete the cut with a second pass. Leave the saw set at the same angle, but guide on the other side of the mark so that the two kerfs will be lined up.

Bevel cutting is sometimes confused with mitering, which is actually an ordinary, straight-blade cut made at 45° across the board. More care must be taken in starting the blade in this cut, and the work must be held securely in place. A bevel cut made at an angle to the board edge is called a compound miter cut. Set the saw blade at the necessary angle and mark the long side of the bevel across the surface of the wood. It is a good plan to make a trial cut with a piece of scrap first.

Rabbeting and grooving cuts. These are made like cross and rip cuts, except that the depth adjustment is set to the desired depth of the rabbet or groove. Several passes may be necessary for wide grooves, but should offer no problem if the cuts at the edges are accurately guided. The second, or edge, cut of a rabbet will require another piece for supporting the saw, as shown in one photo.

Making saw guides. When you are first learning to use the saw, it will help to have a cutoff square. One type is made of aluminum alloy. You can make wooden ones yourself as shown in some of the accompanying photos.

When working with guides, you will find that the wider blades, such as the combination, will saw just a bit short if the guide was made for another blade. Check the exact distance from the guide to the kerf, especially when cutting for joints. END

New for the Handy Man

1. Plastic Plumbing Nails to Wall. A flange along the edge of this flexible-plastic tubing lets you nail it directly to walls or woodwork for easy piping of water throughout a house. With the tubing, you can feed a darkroom, hook up cellar and attic sinks, connect refrigerator and dehumidifier drains, and make other semipermanent cold-water hookups. It comes in 50′ lengths with one coupling for attaching to standard ½″ pipe thread and another for ¾″ garden-hose thread. Two types, for indoor and outdoor use, are available.

2. Trowel and Claw Speed Gardening. This double-ended aluminum tool (below) will dig or rake, letting you do most small garden chores with one implement. The claw end can also be used to tamp down soil.

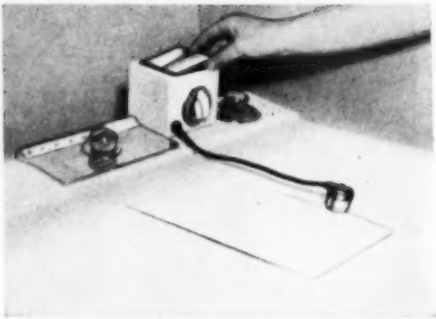
3. Glass Membrane Seals Roof Leaks. Narrow strips of glass-fiber cloth make it easy to patch gutters (below), cracks around flashing, and other roof leaks.

The cloth is placed over the crack and covered with a thick coat of roofing cement, creating a strong, permanent, waterproof patch. It comes precut in narrow ribbons, ready for use.

4. Plastic Catch Is Noiseless. Screw this small plastic barrel to a cabinet and the ball-headed screw to the door, and you have a quickly mounted catch that closes silently and stays tightly shut by friction. The flexible plastic adapts to warped surfaces and slight misalignments of the two parts.

Please turn the page for more handy-man news.

6. Wall Design Rolls On. You can put a wallpaperlike design on any painted wall with the patterned paint roller below. It has a self-feeding one-pint tank, can be used with oil, rubber and other paints, and comes in 32 different designs. When one application is dry, a second or third color can be rolled on top.



5. Drier Fits Clothes Washer. This heater-blower attachment quickly converts any tumbler-type washing machine into an automatic drier. The circular unit (at left) fits in place of the glass window. To keep water out of the blower during washing, a gasket seal must be lifted out of the timer (above) and placed over the opening before the machine will operate. A moisture-sensitive control shuts off the blower when the clothes have dried.

7. Glass Cloth Covers Boat. You can put a complete new waterproof covering on a boat hull with the glass-fiber cloth above. The cloth is cemented to the hull's contours, then coated with a resin that produces a tough plastic finish. Excess material is then trimmed off, and the boat is ready for use. The finish can be precolored by adding chemicals to the resin.

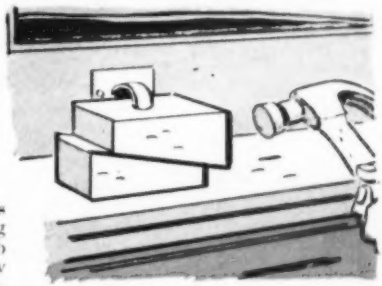
Further information on the products described on this and the preceding page can be obtained from: 1. Nail-A-Tube Co., 36-37 35th St., L.I.C., N.Y.; 2. Canton Mfg. Co., 2408 13th St., N.E., Canton, Ohio; 3. Gibson-Homans Co., 2366 Woodhill Rd., Cleveland; 4. Washington Steel Products, Inc., 1950 E. 11th St., Tacoma, Wash; 5. Turo Dryer Corp., 3 Washington Place, NYC; 6. Motifs, Inc., 166 Beechnut St., Fond du Lac, Wis.; 7. Glass Plastics Supply Co., 333 W. Elizabeth Ave., Linden, N.J.

KEEPING THE *Home* SHIPSHAPE

To support a vine climbing up stone, brick or stucco, press blobs of plastic-composition wood to the wall. When these have dried, staples can be driven in to hold guide wires or strings.

If metal-mesh screens stain the window sills and house exterior below them, you can stop further discoloration by coating the mesh with a two-to-one mixture of boiled linseed oil and turpentine.

A low basement light is less dangerous if it swings freely than if fixed rigidly at head level. By mounting junction box and porcelain socket on the side of a joist, a lamp bulb can be plugged in as shown.

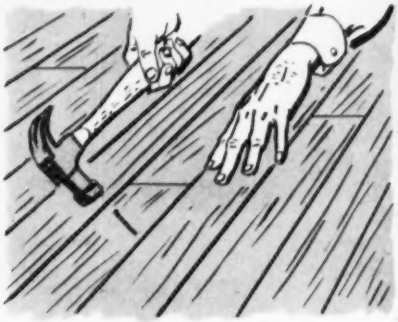


A stuck window that has finger grips at the sill can often be pried open with two wood wedges. Wax the meeting sides of the blocks so the upper one will slide easily when tapped with the hammer.

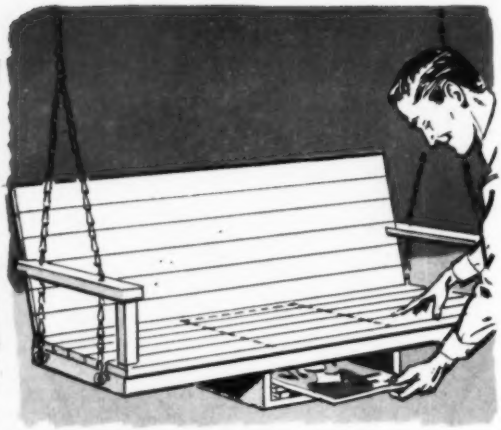
Painting radiators with a bottle-cleaning brush makes the job go faster. The narrow head on the long handle fits easily between the leaves and into hard-to-reach spots. Use a flat wall paint of a light color for the most efficient heat radiation.

Please turn the page for more home tips.

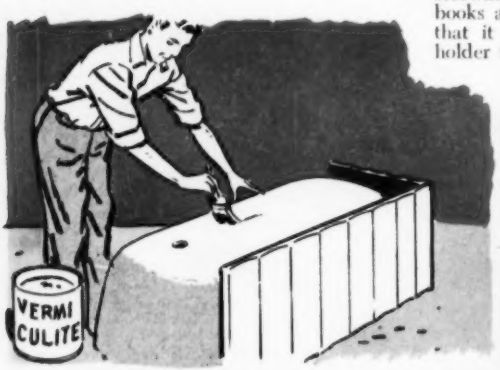
More Home Tips



Get rid of floor squeaks by driving 2" nails into the boards at an angle, close to the edges. Use a nail set to sink the heads, then fill with plastic-composition wood or putty. Sand and finish.



An uncluttered swing will invite use when you have an idle hour to spend. Keep the seat clear by screwing an open-ended box underneath it to hold books and magazines. Paint or varnish the box so that it matches the swing. Attach the magazine holder to the seat with flathead screws.



Before installing a bathtub of rolled steel, insulate bottom and sides with a mix of cement and vermiculite and bath water will stay hot longer.

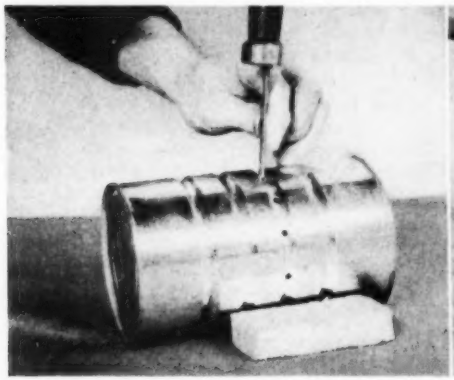
Cedar-lined closets and cedar chests will have a more deadly effect on moth larvae if they are lightly sanded about once each year. The sanding reopens closed pores in the wood, renewing the pungent quality of the cedarwood oil.

A drinking fountain outdoors will keep your youngsters and the neighborhood gang from tracking up the kitchen. Replacing the garden faucet so the water spouts upward is the simplest dodge. But adding a standpipe and attaching a second faucet upside down will put the spout higher.

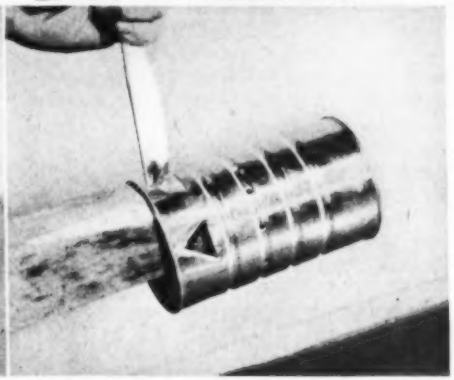
How to Make a
Tin-Can Barbecue

Mate a juice can with a coat hanger, drop in some charcoal, and presto!—you've got a fire for coffee, or bacon and eggs.

QUICK COOKING HEAT at roadside, beach or picnic spot is a cinch with this juice-can barbecue you can make in 30 minutes. One loading of charcoal perks a quart of coffee, fries a panful of eggs or sizzles a small steak.



A RIBBED JUICE CAN of the 1½-qt. size forms the body (a similar, larger stove could be made from a 2-qt. or 1-gal. can). With a nail, punch a dozen holes inside one rib, a bit less than halfway up around the can.



CUT OUT cleanly both top and bottom of the can. Then hang it over a fence post or on a stake held in a vise, and use a cold chisel to cut five or six triangular holes around it near the bottom for the draft.

BEND JAGGED EDGES of the triangular holes over on the inside. Then cut pieces of coat-hanger wire and insert them in the holes so that they cross inside the can, forming a grate. Bend the wires over outside like this.

AN ASBESTOS LINER is the secret of success. Cut a strip of sheet asbestos to reach from the grate to the top of the can, and wide enough to overlap itself slightly. It conserves heat and keeps the can from burning out.

A professor's experiment shows that even a beginner can build good-looking living-room pieces from easily obtained materials.

Simple Designs Cut Cost of Modern Furniture

By Milt Grassell
PHOTOS BY FRANCIS R. SCHULTZ

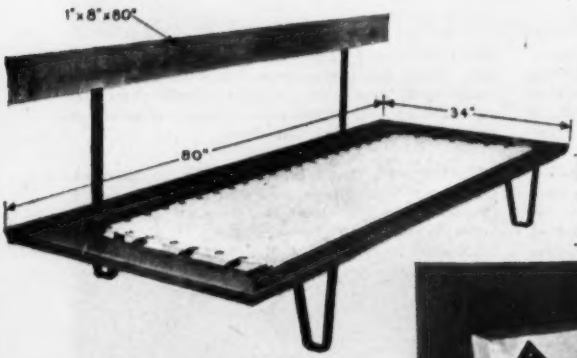
DEMETRIOS JAMESON is an art professor at Oregon State College who had a taste for modern furniture—but without the modern price tags. Then he got an idea: since modern designs are basically simple, they ought to be simple to build. He set out to prove it. The results include a full-size living-room sofa and a pair of matching end tables that are as swank as any store-bought models—at a fraction of the cost.

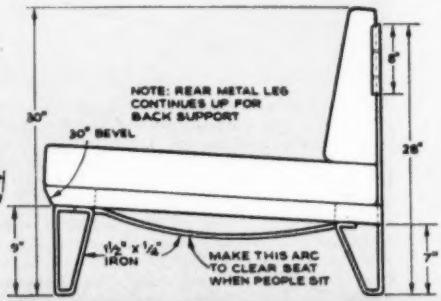
The sofa is just a low frame to support a colorfully covered cushion. Stub legs, bent from cheap metal strap, are carried up at the rear to hold a single plank that serves as a support for the back cushion. By tricky cutting, both seat and back are formed from one foam-rubber double-bed mattress 4" thick by 54" wide. Such mattresses can usually be bought from mail-order houses for from $60 to $90.

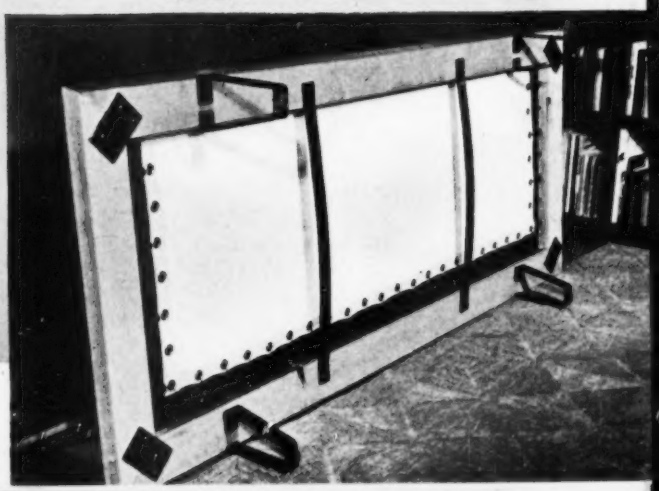
The matching end tables are merely slabs cut from an old solid flush door. To conceal the sawed edges, 1"-by-2" hardwood strips are fastened around the sides. Hollow-core doors, about half the price of solid ones, can also be used, and here the hardwood edging offers a neat way both to hide and strengthen the exposed core edge.

The legs are ½" steel rods set into holes drilled in the underside of the tables. On hollow-door tables, the rods can be set into small 2"-thick wood blocks and the blocks glued to the underside. Dime-store crutch tips finish off the lower ends of the rods.

How simple can you get?

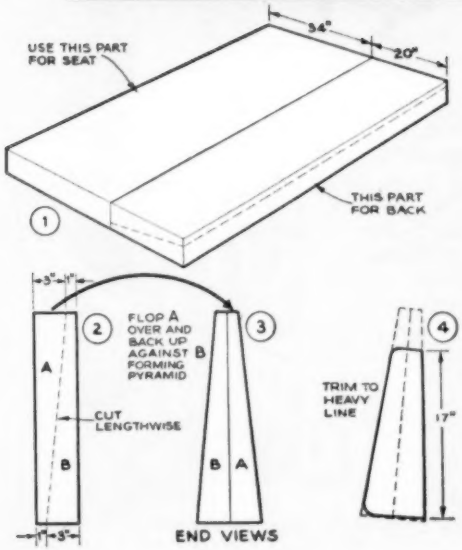




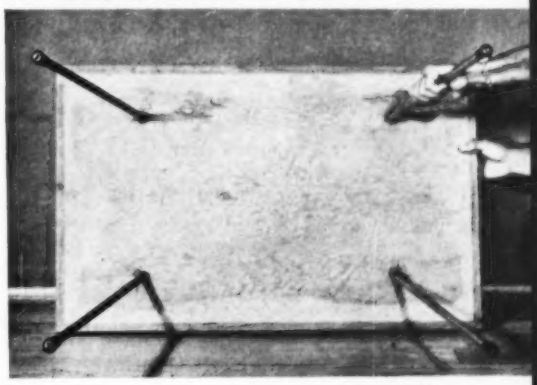


FRAME FOR COUCH is made of two-by-fours braced by metal plates at corners and bowed straps at middle (right). Canvas insert is tacked rigidly to front edge, then fastened to other edges with 2" springs available at auto and hardware stores. Springs are held to frame by screw eyes 3" apart and to canvas by eyelets.

How Foam-Rubber Mattress Is Cut to Make Cushions for Couch

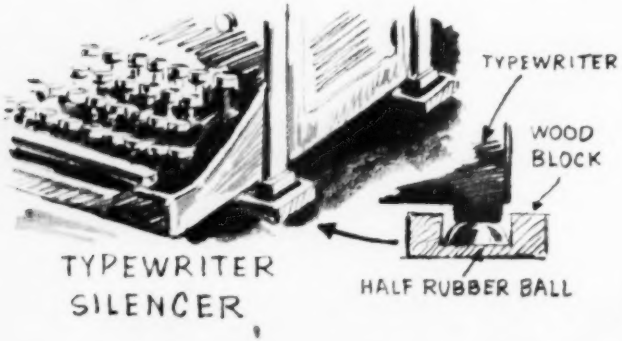


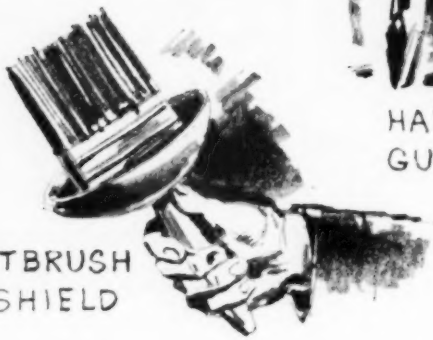
END TABLES, cut from old slab door, are both 34" long to match depth of couch. Edging of 1"-by-2" hardwood is glued on and held by small brads. Legs of ½" steel rod are driven into snug holes drilled at 60° angles to give them outward splay. Table should be level with or slightly above seat height. END

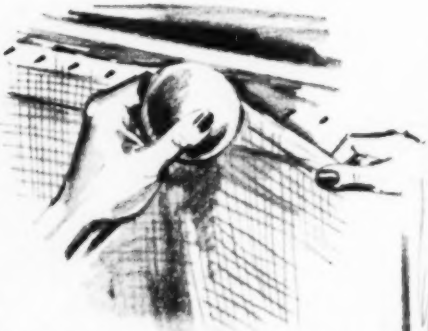


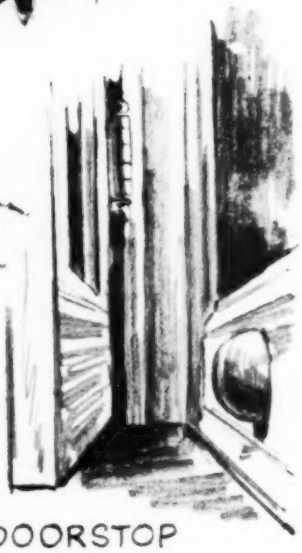
6 USES FOR Rubber Balls

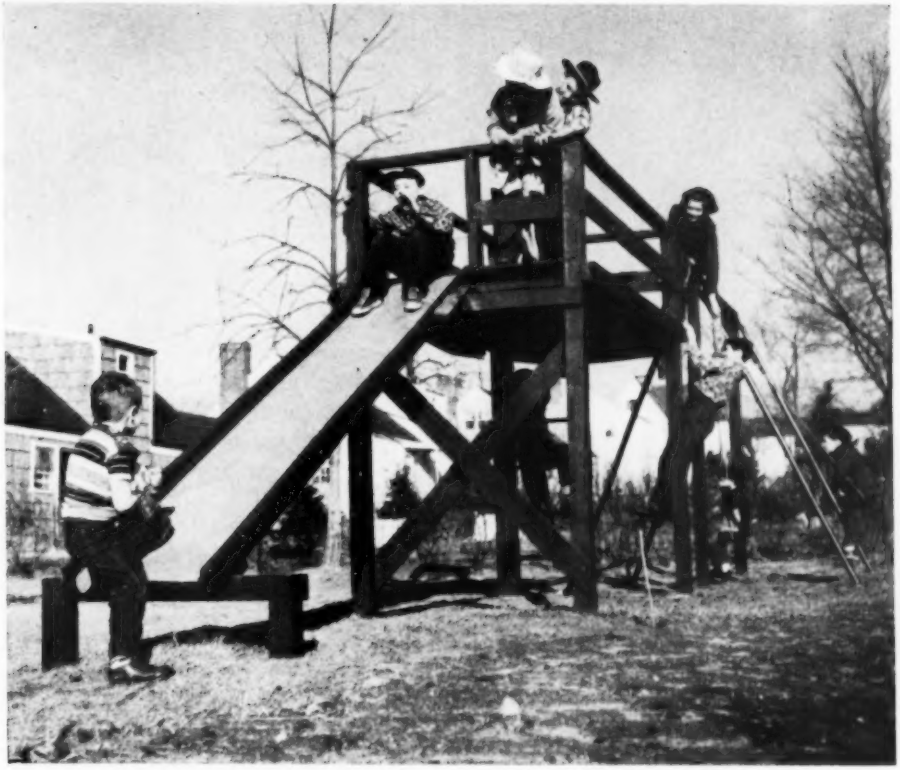
Hollow or solid, large or small, they can do many jobs—if you can get them away from Junior.











All the youngsters will have fun this summer on a

Back-Yard Play Platform

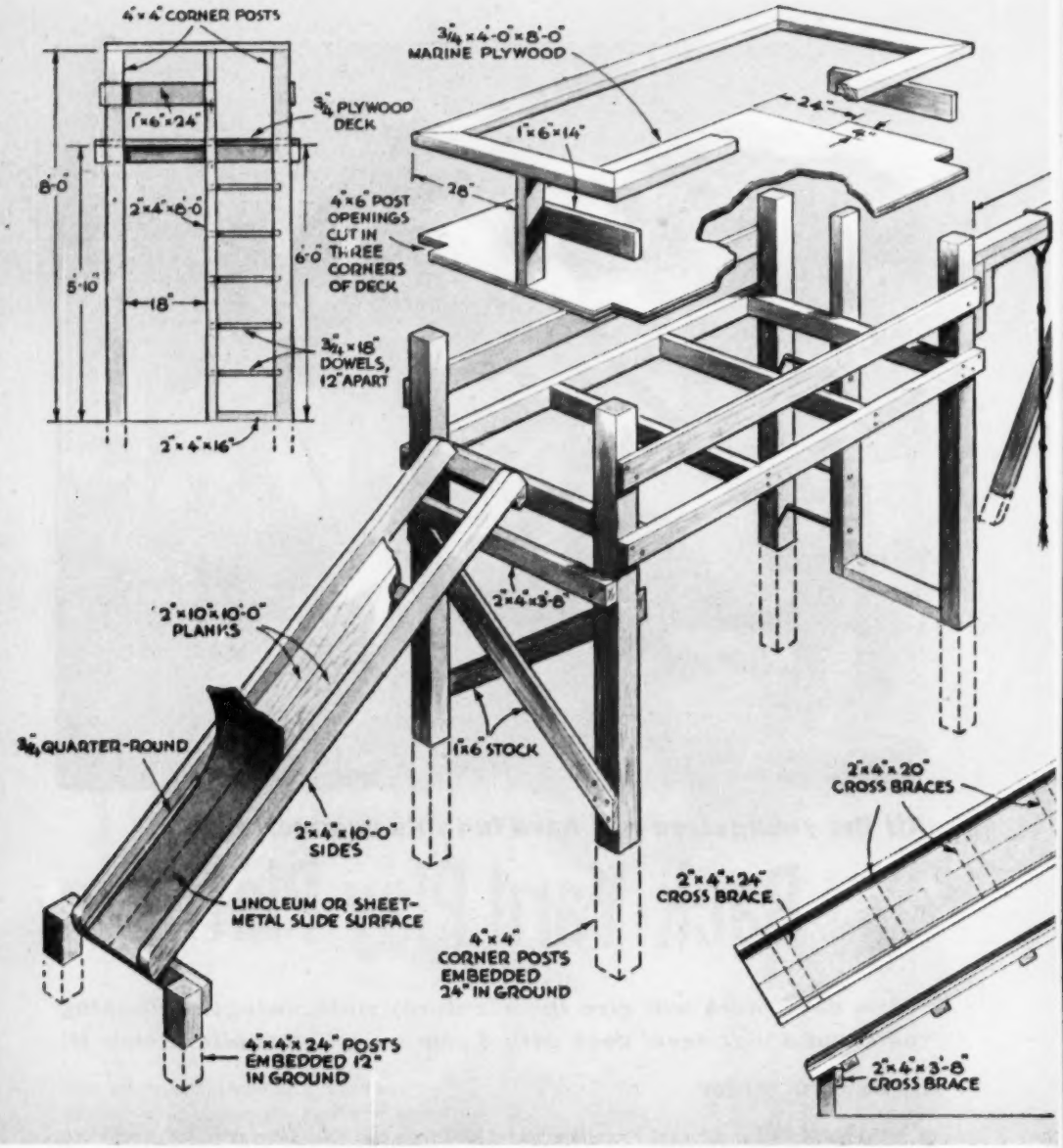
A few days' work will give them a sturdy slide, swings, a climbing rope, and a high-level deck with a canvas-walled shelter below it.

By David C. Miller

OUR back yard is a rocket-launching station, an aircraft carrier or a rodeo corral, depending on the fancy of the youngsters. In summer they shoot down a slide into a plastic wading pool. In winter, their sleds beat Olympic bobsled records on the same steep slope artificially glazed with ice. And the bikes, sleds, toy earth-diggers and other stuff that was always underfoot before we built our back-yard play platform is now stowed away in a spacious canvas shelter under the deck.

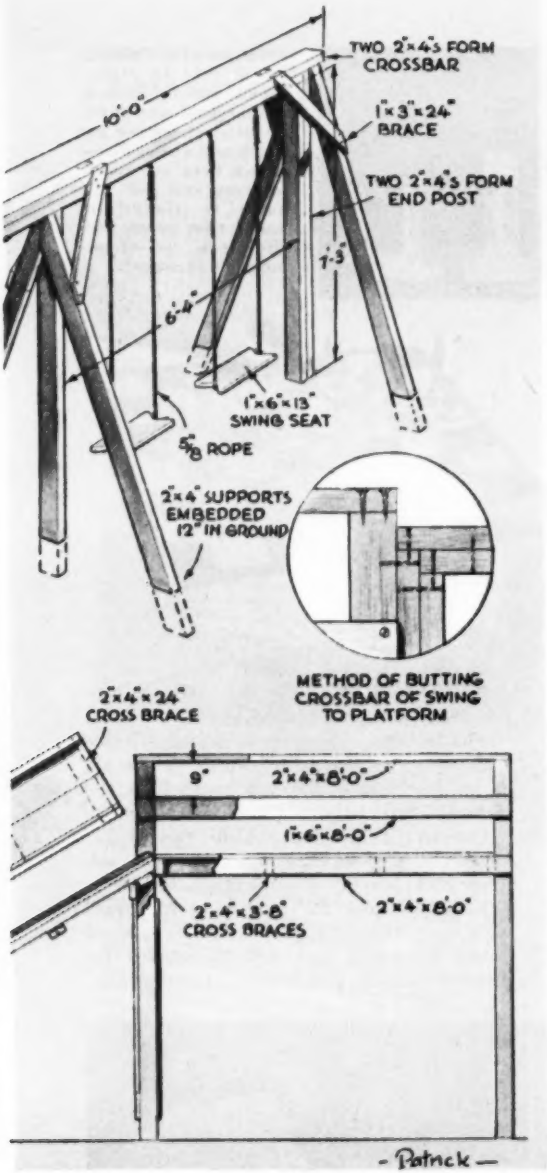
You can build a similar platform for considerably less than any comparable outdoor gym you can buy. Ours cost $80, including canvas flaps, rope and hardware.

The platform. We used a 4′-by-8′ sheet of exterior plywood as a starting point for measurements. This was to be the platform deck. Four 10′ four-by-fours serve for uprights. Creosoted and embedded 24″ in the ground, these are linked with a framework of deck-supporting two-by-fours. The long horizontals are nailed to the outside faces of the uprights, with their top surfaces 6′ and 5′ 10″ above the ground, respectively,



which gives our deck a rain-shedding pitch. The cross stringers—four of them—measure 3′ 8″ each. Two are nailed to the inside faces of the uprights. The other two are used as intermediate supports. Rectangles 4″ by 6″ sawed from three corners of the plywood sheet, and a 4″-by-24″ rectangle cut from the fourth corner, allow the plywood to be slipped down between the uprights. The 18″ recess left on one side of the deck gives us a clearway for a ladder.

The ladder. The corner upright on one side of the clearway forms one side of the ladder. The other is an 8′ two-by-four. The rungs are 18″ lengths of ¾″ hardwood doweling placed in holes 1″ deep at 12″ intervals. A spacer block, made of a two-by-four, anchors the bottom end of the ladder. A few nails fasten the top to the platform-supporting cross stringer.



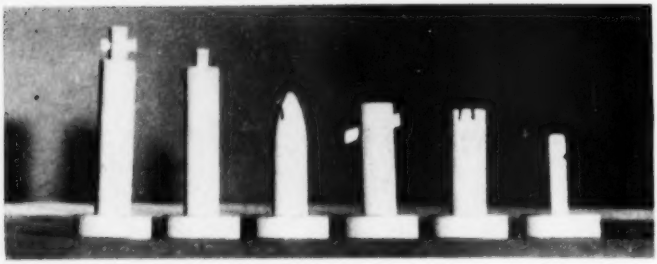
AFTERTHOUGHT was this shelter for bikes and toys, made by battening canvas flaps to the platform. When not in use, canvas is rolled and held to the deck with short lashings.

Slide support and guardrails. At the other end of the platform, a 3'8" length of two-by-four is nailed to the outside faces of the corner posts, with its top surface 5'6" above the ground. This forms a horizontal support for a slide. Diagonal braces of 1"-by-6" stock are also nailed across the uprights to stiffen the whole assembly. The sections of the uprights projecting above the deck serve as corner posts for a protective fence around the platform. The top guardrails are two-by-fours placed flat. Midway between them and the deck there is a second set of rails, broken at the ends to let young gymnasts reach the deck from the ladder and take off on the slide.

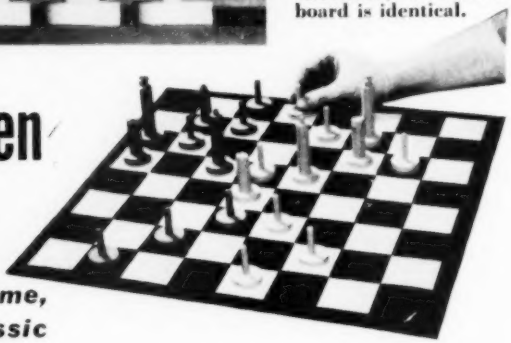
Building the slide. Our slide is made of two 2"-by-10" planks, 10' long, cleated side by side to five two-by-four crosspieces. The top crosspiece is beveled and nailed flush against the deck-supporting stringer.

An alternate way of anchoring it would be to use a wider crosspiece, one that would lock over the slide support instead of simply resting on it. Either way, the slide is prevented from pulling away from the platform because its bottom crosspiece butts against a 3'8" piece of two-by-four nailed between two 24" lengths of four-by-four, each embedded 12" in the ground. Slide sides are two-by-fours, nailed to the edges of the planks. For a smooth slide surface we used linoleum. Sliders are kept from catching their clothes on the nails that hold the linoleum in place along the edges by two strips of quarter-round.

The swing gantry. Two-by-fours, nailed together to provide intersupported ends (see detail drawing), made a sturdy swing gantry. The horizontal member is butted to one platform upright, where blocks below it hold it firmly. Three feet out, a single two-by-four separates the climbing rope from the swing section. Both the two-by-four and the built-up four-by-four at the outer end of the gantry are braced by diagonals. We used piping for these braces, but two-by-fours would do. In either case, both uprights and diagonals should be embedded 12" in the ground. Less than 50' of rope, five screw eyes and two swing seats rounded out our project, except for the addition of canvas flaps. END



THESE ARE THE FIGURES. From left to right: king, queen, bishop, knight, rook and pawn. Usually, chessmen are black and white. Those shown here are painted ivory and red. The game is played on board that came with checkers, as chessboard is identical.



Modern Chessmen Made of Dowels

You can make these handsome, simplified versions of classic pieces for less than one dollar.

THE game's the thing in chess. An elaborate set of chessmen is secondary. Still, these dowel figures make a cleanly styled set. Raw materials? Lengths of ½" and ¾" dowels, a few inches of lollipop stick and some paint. Checkers with holes bored in them support the figures.

Buy two boxes of checkers. They come 30 to a box and 32 chessmen are needed. Extras are handy if you split some.

Pawns (16 required) are 1¾" lengths of ¾" dowel rounded on one end.

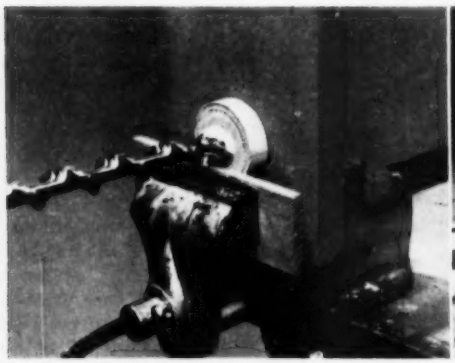
Rooks (4) are made of ½" dowels, 2" long. Saw cuts at top simulate castle tower.

Knights (4) are also 2" lengths of ½" dowel. Drill holes at an angle near the tops for short pieces of lollipop stick.

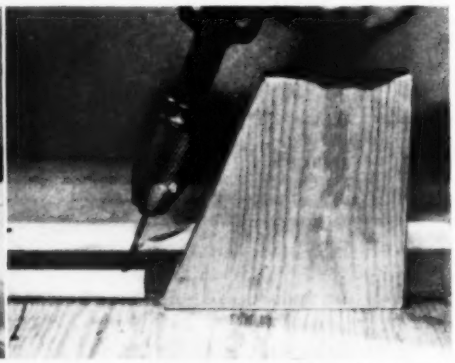
For bishops, (4) turn or whittle Gothic ends on 2" lengths of ½" dowel. A saw slit at an angle near the top symbolizes the bishop's miter.

Queens (2) are taller. Drill tops of 2½" lengths of ½" dowel and insert pieces of lollipop stick, leaving ¾" projecting.

Kings (2) are 2½" lengths of ½" dowel with tops drilled for ¾" dowel. Leave ½" of dowel projecting and drill through it for piece of lollipop stick to form cross "crown."



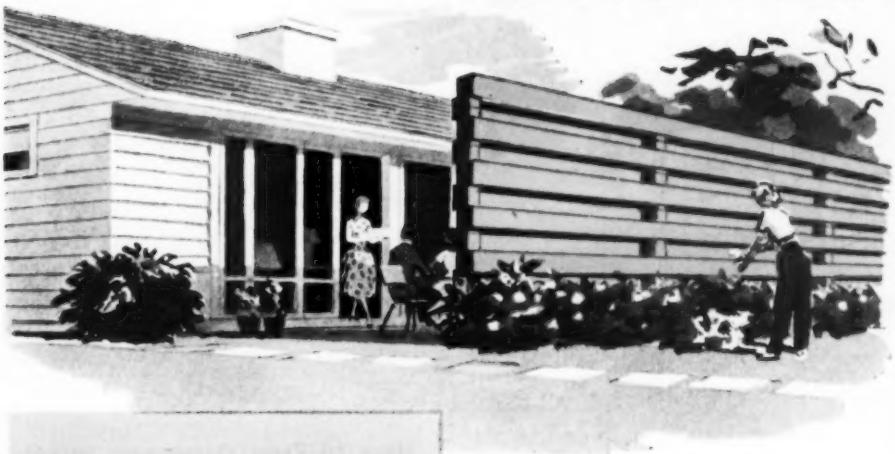
WHEN BORING CHECKERS, back them up with a piece of scrap wood on the bottom side. Wood strip protects checker top from bite of vise.

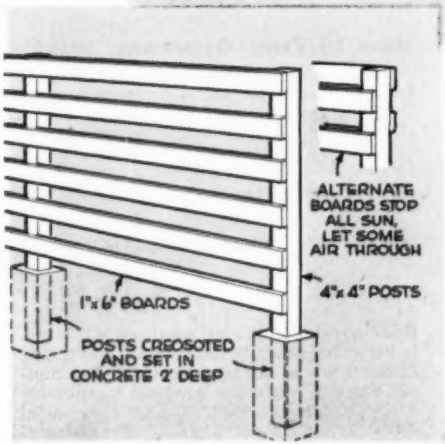


DRILL HOLES FOR KNIGHT CROSSPIECES at uniform angle by sight-guiding along wood piece cut to 60° on one edge.

Need some shade, more breeze or less, or a little privacy to make summer living more comfortable? Take a look at these . . .

Sun and Wind Screens for Your Home





Sun fence, built higher than ordinary fence, is a good way to get shade on a western exposure that faces the hot afternoon sun. Using alternating boards nailed on opposite sides of 4"-by-4" posts (at top of page) will shut out nearly all sun but still let some breeze through. Spaced boards (at left above) let some sun through, but take only half as much lumber to build. Space posts not more than 8' apart, and cement ends at least 2' in ground.

By Sheldon M. Gallager

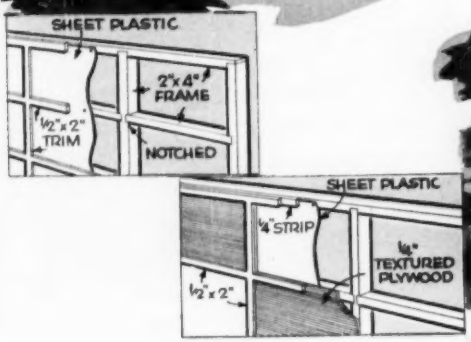
AS NICE as summer living is, nature may not have just happened to deposit a shaded woods, cool shore breezes and a mountaintop view all in your own back yard. To stay comfortable, you may have to add a bit where nature left off.

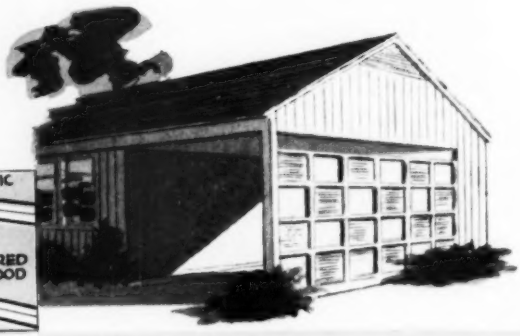
You'd like more shade, but a sunbreak would block all your light. Maybe you're tired of looking at your neighbor's trash, but a privacy fence would also cost you that last whisper of a much-needed breeze. Perhaps you have too much breeze, but a windbreak would kill a fine view.

Whatever the problem, here are several ways to keep out what you don't want while letting in what you do. By selecting one that best suits your needs, or by combining several types, you can custom-tailor your summer living for real summer comfort. Please turn the page for more ideas.

4 More Ways to Put the Sun and the

Translucent plastic cloth, the inexpensive kind used to screen in chicken coops, lets sunlight through, but shuts out heat and your neighbor's garbage can. Staggered panels (at left) act like gigantic louvers, letting cool breezes through without sacrificing shade or privacy. Plastic panels are also a neat way to enclose an open carport for a terrace (below) or a breezeway for an outdoor dining area. Use type that has fine-mesh, metal fly screen embedded in plastic for strength, and keep individual grid sections to 2′ by 3′ or less to avoid sagging of material. You can get a striking decorative effect by combining plastic panels with thin textured plywood in a checkerboard pattern (at left below).





How to Find Overhang Width

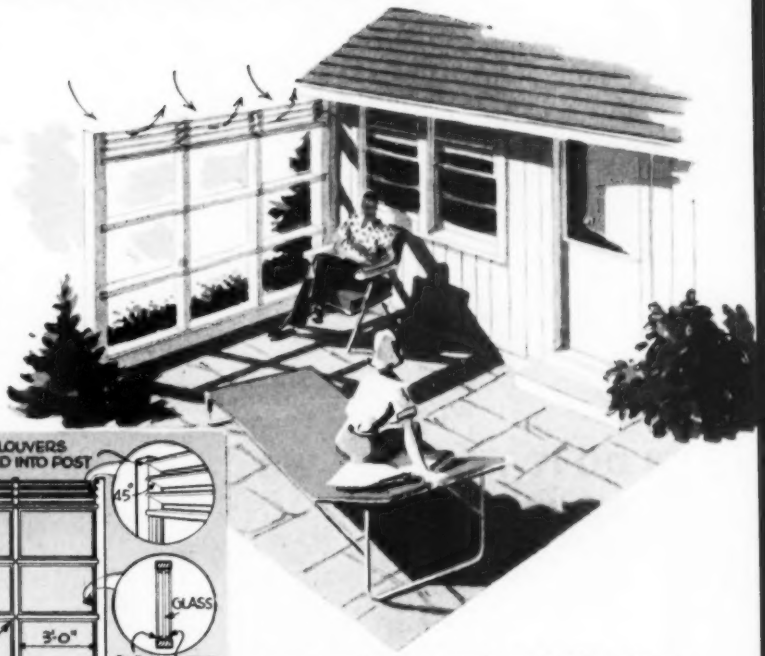
To find amount of overhang for your locality, first look up your latitude on a map and select matching factor from chart below. Then measure desired shadow height and multiply this by the latitude factor. Result will be width of overhang.

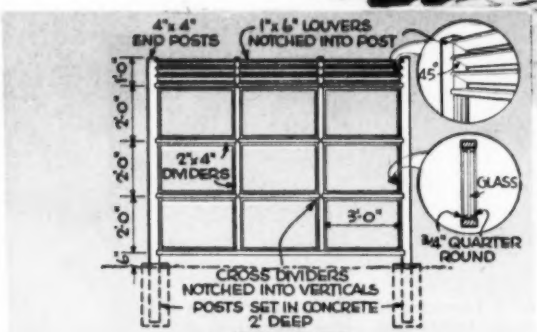
LATITUDE	25°	30°	35°	40°	45°	50°
FACTOR	.37	.48	.59	.71	.85	1.02

Roof overhang shades windows when sun is high, is especially effective on south side of house where sun beats down all day. Simple slat-type extension, made of inexpensive 1″-by-2″ furring strips supported on metal brackets, has modern appearance and creates pleasing shadow patterns on house and ground. If more than 2′ wide, overhang can be braced on outer edge by posts in ground at 4′ intervals. Short sections can also be made to cover only individual windows. Fasten overhang under edge of roof so it will not interfere with rain gutter, and paint brackets to match house. Table above shows how to figure the amount of overhang you need for any desired height of shadow on the wall of the house.

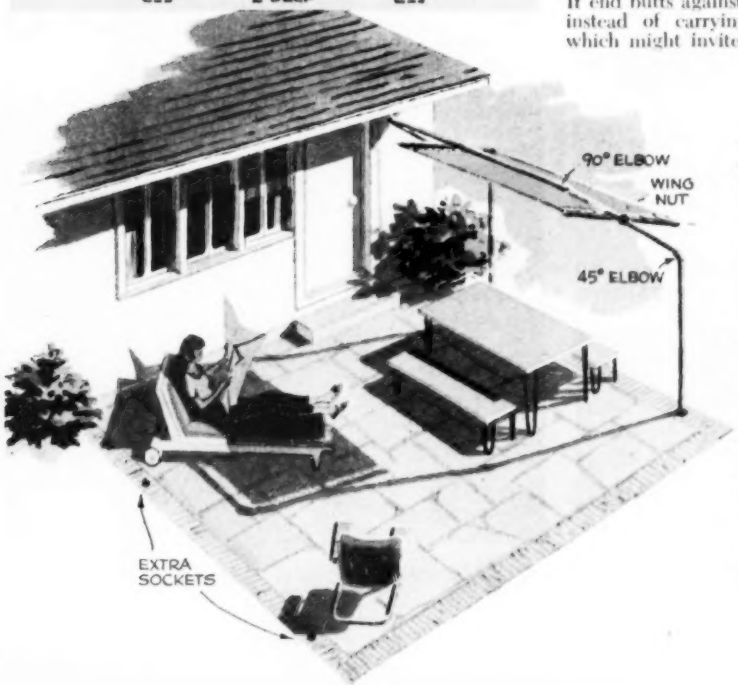
Wind Where You Want Them

If you have a good view, but a little too much breeze to enjoy it, this glass windbreak may be the answer. Good for gusty hilltops and shoreside spots, it's made of inexpensive single-weight window panes set in a wood frame. Slanting louvers at the top help channel the wind upward so it won't spill down over the edge. Narrow open space at the bottom lets some breeze through and reduces wind-loading on the fence.





Glass windbreak is made much like ordinary window, except that careful fitting and sealing are not needed. If fence is longer than 9', add extra posts at 6' intervals to support weight. If end butts against house, nail it to wall studs, instead of carrying post down into ground, which might invite termites.



Shade to order. This pivoted canvas baffle can be tilted horizontally when sun is high, then gradually swung vertically as sun sinks low in the afternoon. A simple frame of pipe, it can be slipped into duplicate pairs of ground sockets for quick switching from one side of a terrace to the other and for removal in winter. For spans up to 4', use 1" pipe (inside diameter); beyond that, 1½" or 2" pipe. Make ground sockets of next larger pipe diameter that will slip over ends of frame, and cement 1' lengths in ground. Lash canvas to pipe arms with heavy cord through eyelets. Use ⅜" bolts with wing nuts to tighten arms against upright frame. END

Pivoted Sign Can Be Quickly Changed

OPERATORS of motels and tourist homes can save time with a sign like this. Just pivot it to display the "no vacancy" lettering. Make the frame of one-by-twos. Install a removable pin in a hole to keep the wind from turning the sign.—*L. G. Lands, Charlotte, N.C.*

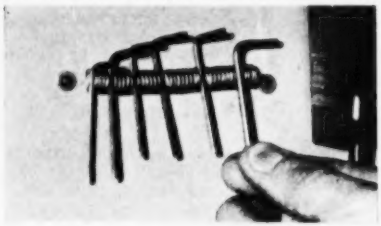
Oily Sand Stops Rust

GARDEN tools won't rust if you run the metal parts through a box of sand mixed with some crankcase oil each time after they are used.

DO IT THE EASY WAY

TO MEASURE a level spoonful of powdered coffee, cut and remove half of the paper seal on the jar. Use the edge as a scraper to smooth the coffee.

YOU WON'T HAVE TO FUMBLE around looking for small hex wrenches if you store them in a spring holder like this.

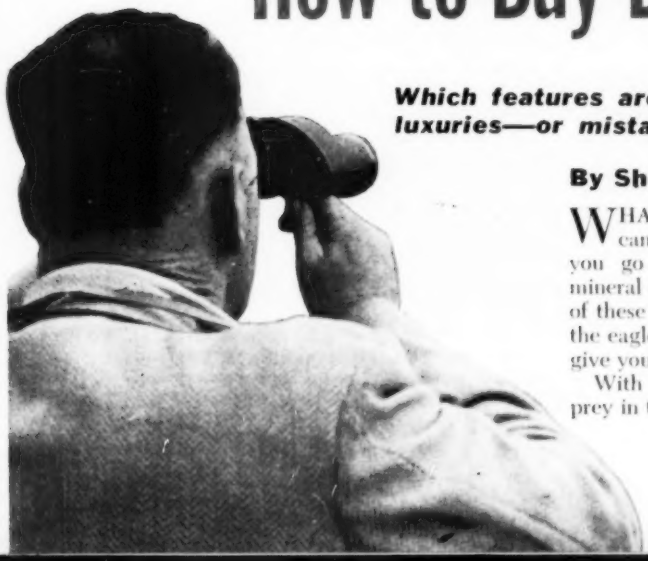


AS A SANDING BLOCK, you can't beat a brick. Pad it with cloth and attach the abrasive paper with a rubber band. The weight saves pressing so hard.

A PLASTIC LAMP SHADE is handy as a shop funnel. It's especially good for returning small parts to a container.

THIS IS THE DIFFERENCE between the way a black bear looks to unaided eyes (left) and through binoculars of 7X power (above).

How to Buy Binoculars

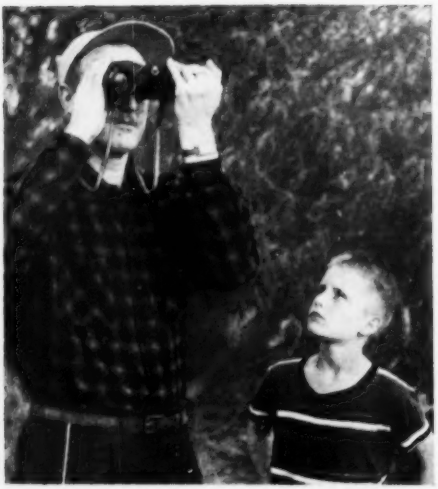


Which features are necessities? Which are luxuries—or mistakes? Here's how to tell.

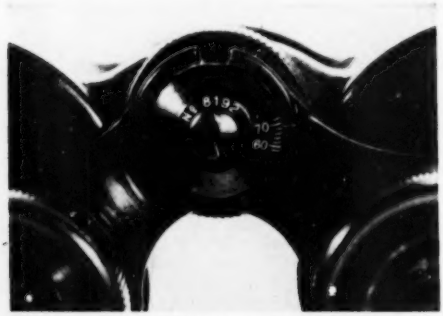
By Shep Shepherd

WHAT is your hobby—baseball, football, camping, sailing, hunting, fishing? Do you go in for scenic tours, bird study, mineral collecting, the opera? If you do any of these things, you'll enjoy them more with the eagle-eye vision that only binoculars can give you.

With binoculars, the hunter stares his prey in the eye—from a safe distance. Sports



ALL BINOCULARS, however focused later, are first focused for one eye at a time. Hand covers one lens. Shutting one eye would strain the other and give an incorrect focus.



HINGE permits adjusting distance between barrels to match the user's eyes. Scale shows setting. Telltale sign of quality is smooth action of hinge, the first thing an expert notes.

fans sit on top of every play. Rockhounds can inspect cliffs for mineral outcrops from afar. Hikers can pick the best camp site within wide range; canoeists, the best portage. Natural wonders are brought near for sight-seers.

What should you know, if you're buying binoculars? Here are the ABC's and some inside stuff, too.

Binoculars, like field glasses, are essentially a pair of telescopes. But the straight barrels of field glasses would become overlong and unwieldy for greater magnification than about four times. So binoculars have reflecting prisms, which provide a zigzag optical path of the needed length within a compact and readily portable instrument.

Binoculars bear numerals like 7X, 35 or 8X, 25. The first number tells the magnifying power: 7X means that the glasses magnify seven times. For all-around use, that power is ample. It makes a quarter-mile-distant object look less than 200 feet away. And glasses of 7X power can be held comfortably steady.

Is high power desirable? An average user may find greater magnifying power an expensive mistake. The view won't hold still when high-power glasses are held in the hand—at 10X, even the heartbeat makes it dance. Such glasses need a rest or support, which may not always be at hand, or convenient to lug around in the field. What extreme magnifying power would cost can be invested much more wisely, and rewardingly, in other optical qualities such as superior definition—of which, more later.

The second number on binoculars concerns the brightness of the view they give. It tells the diameter of the objective lens, the lens opposite the eyepiece, in millimeters. Divide it by the magnifying power, and you have the diameter of the light beam reaching the eye—five mm. for 6X, 30 glasses. The larger the beam, the brighter the image, within limits set by the capacity of the human eye. For in bright daylight, the pupil of the eye normally contracts to about three mm. (about ⅛ of an inch) in diameter, and can admit only that much of a wider light beam, although it enlarges considerably at night.

This means that in daytime a 6X, 15 or 8X, 25 glass approaches or equals the maximum brightness possible, making it fully adequate for sports or scenery. The popular 7X, 35 model offers a generous reserve of brightness at dawn or dusk, as well as ideal daytime seeing.

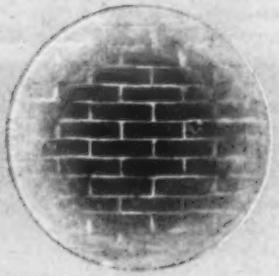
Few if any landlubbers would ever need the 7X, 50, which the Navy calls a "night glass," and whose big objectives pay off only after dark.

Which type? Binoculars come in two styles, central-focusing and individual-focusing, by one and two adjustments respectively. For close-up subjects, requiring frequent change of focus, central focusing is the more convenient. But users whose objects of interest are all beyond 100-foot range will never need to change focus. They may prefer individual-focusing glasses, whose only moving parts, the closely threaded eyepieces, are better proof against dust and

These Tips Will Help a Novice to Judge Binoculars' Quality

LOOK FOR COLOR FRINGES along buildings' edges. Prominent color bands detract from sharp definition by fusing details together, and indicate inferior optical workmanship.

ARE STRAIGHT LINES badly distorted, especially near edge of field? (For clarity, effect is greatly exaggerated above.) Glasses of the best quality show the least distortion.



FOCUS SHOULD BE SHARP over whole field at once. Through inferior glasses, a brick wall may look like this: when the bricks at center are sharply in focus, the others are fuzzy.

moisture. This type is always specified for military use.

Suppose you decide you want 7X, 35 central-focusing glasses, just for example. The story doesn't end there. For a dealer may show you five to 20 pairs, ranging in price from $35 to nearly $200. They're a cross section of some 150 makes currently being offered, which vary even more extremely in quality than in price.

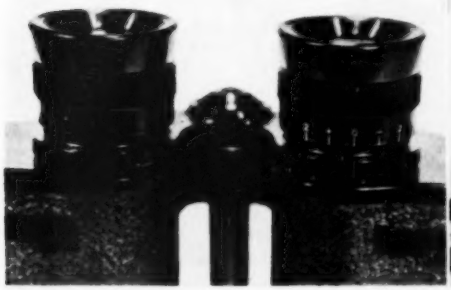
Among these are well-known names, in themselves an assurance of reliable quality: Bausch & Lomb, Leitz, Hensholdt, Bushnell, Swift & Anderson, Wollensak. Far more numerous and often "bargain-priced" are unfamiliar makes, of which many appear suddenly on the market, and as suddenly vanish.

Outwardly all look alike. Even when you look through them, you may not see at once why one pair is better than another. If you ask the dealer and he shrugs and says, "You get what you pay for," you're still in the dark.

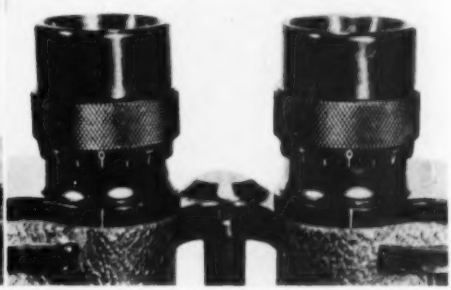
How can a novice judge the quality of binoculars he is offered, right in the dealer's shop? Here is an expert's advice on a number of ways to do it.

A test for distortion is simple to make. Focus the glasses on a building, telephone pole or steeple not far away, and bring its straight edge near the border of your field of view. Is the straight line badly curved, in or out? All glasses show some distortion of this kind; however, the best binoculars minimize it.

Look for color fringes, by sighting toward a building silhouetted against the



TWO STYLES OF FOCUSING offer choice. Central focusing, handier for frequent changes, uses center knob. One eyepiece is adjustable, for difference in eye strength.



EYEPIECES are independently adjustable in the glasses above, with no other focusing mechanism. Military users and others like their resistance to dust and moisture.

sky. A conspicuous band of color along its edge isn't good. Most prominent in inferior glasses, color fringes surround details of an image and fuse them together, impairing definition.

Is focus evenly sharp? Point the glasses at a brick wall, near enough to distinguish the individual bricks. When bricks at the center of the field are sharply focused, are the ones at the edge of the field badly blurred—or vice versa? This lack of uniform focus, called "curvature of the field," means that only part of the view can be seen well. Better glasses give you the benefit of their whole width of field.

How good is the definition? To compare different glasses *of the same magnifying power,* prop up or pin up a page of a newspaper—and see from how far away you can read fine print with each glass in turn. You can best do this sitting, turned around, in a chair and resting your elbows on its back to steady the glasses. Mark the position of the chair after each trial.

The best glasses, of course, are the ones that make the print legible at the greatest distance. While this is only a rough-and-ready test, it should show up any marked differences in quality.

Binoculars could meet these optical tests and still be worthless junk, without good workmanship elsewhere.

Flimsy glasses prove no bargain. Take alignment, or "collimation" as technical people call it. Naturally the binoculars' twin telescopes must point in the same direction. A slight misalignment would strain the eyes, and a really serious one would be intolerable.

Now, there's no reason why any new binoculars, no matter how poorly made, shouldn't be in good alignment—a factory adjustment of objectives or prisms does it. Whether they'll *stay* aligned, despite the bumps that glasses get in ordinary service, is something else again.

To play havoc with alignment, any one of the four prisms needs to move only half a thousandth of an inch. Lightweight but firm metal mountings for prisms call for craftsmanship of a high order. The maker of fine glasses is justly proud to be able to say that nothing short of wrecking them can disturb their alignment—and back it up, as does Bausch & Lomb, with a factory guarantee.

A "bargain" pair may prove no bargain after all if repairs cost you $7.50 to $25 each time it goes out of alignment, as can happen again and again, for no repairman can cure faulty or flimsy construction.

Are there ways you can detect poor workmanship? After all, no dealer will let you give the binoculars in his case the Army and Navy Shock Test. But there are some telltale signs to guide you.

Feel the hinge action—as an expert does, first thing, when he's handed a pair for inspection. To match a user's eye width, the barrels swing on the hinge. It should yield smoothly to pressure and hold firmly when released. So should all focusing adjustments. Binding or looseness bares sloppy

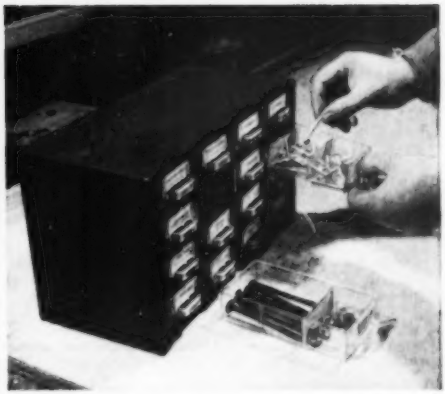
[*Continued on page 254*]

Tripod Adapter for Powerful Binoculars Gives User Steady View

BEYOND a magnifying power of about seven times, as explained in the article above, binoculars become hard to hold steadily enough in the hand for satisfactory viewing, and a support is needed. For those who nevertheless want glasses of extreme magnifying power, or have them already, this newly devised clamp should prove a useful aid.

The accessory adapts any standard camera tripod to serve as a steady support for binoculars. When the base of the clamp has been engaged by the tripod screw as shown, the glasses are inserted in it, and a thumbscrew tightens jaws that grip them securely. Designed to be sold for $3.50, the adapter will be introduced by the Mackson Instrument Co., Ridgewood, N. J.

New Tools

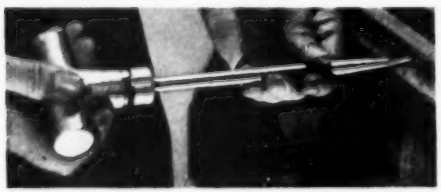


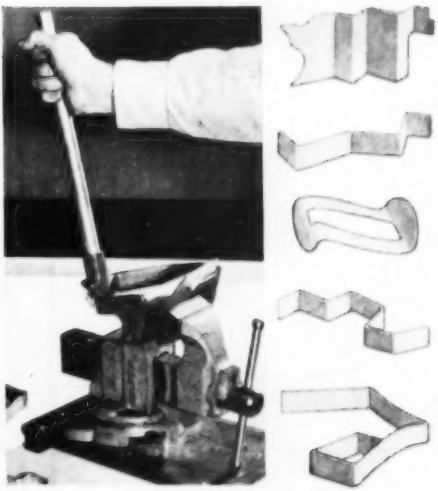
1. Sander Clamps on Motor. Bolted directly to the motor housing, this portable belt sander eliminates drive belts and pulleys and can be moved quickly from job to job for use without bolting down. The lower wheel mounts on the motor shaft, and the upper one rides on an adjustable spring that keeps tension tight on belts from 42″ to 46″ long and up to 1″ wide. It has a removable table and backing plate and swings out of the way when not in use.

2. Cabinet Stores Small Parts. You can set up your own filing system for screws, bolts and other small parts with this versatile storage cabinet. Clear-plastic drawers let you see what you've got, or they can be marked with labels that slip in small slots on the front. Slots on the inside of the drawers let you drop in dividers to suit different-size parts. The cabinets can be hung on a wall and come with 16, 24, 32 or 48 drawers.

3. Bending Brake Mounts on Vise. Clamp the inexpensive bending tool (at right) in a vise, pull the lever, and the pivoted roller will put a clean, sharp crease in metal. To bend a radius, a piece of round stock is slipped under the metal. The tool will bend light sheet up to the jaw width and narrow strips up to 3/16″ thick.

4. Screwdriver Has Clutch Handle. You can get a real twist on the T-shaped screwdriver (below). The pivoted handle has a six-position, clutchlike drive that lets you turn the blade without changing your grip. A spring holds the tip in the screw as you back off the handle to take another bite.

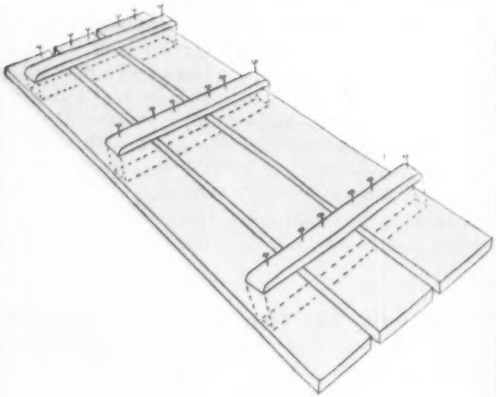


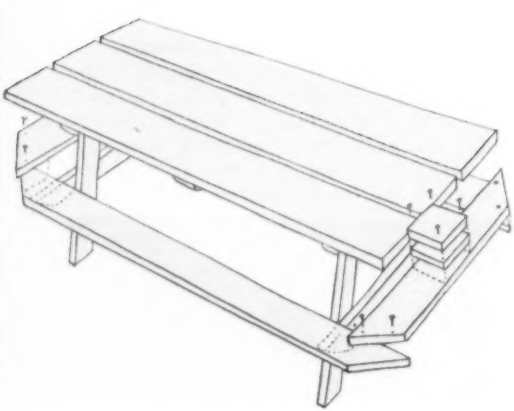


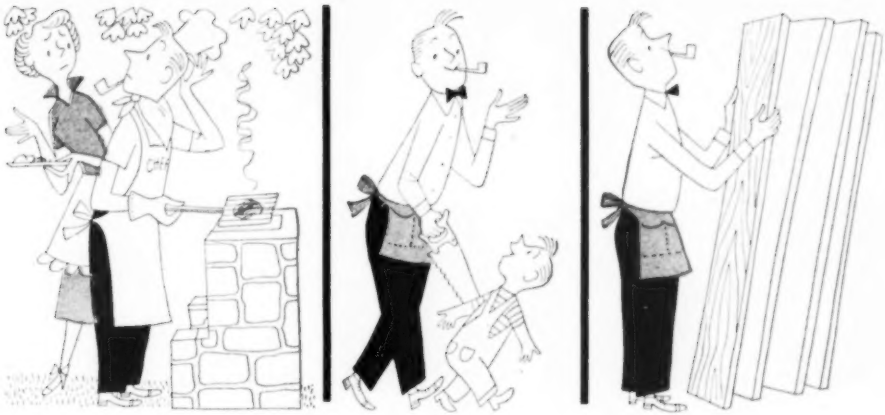
Further information on the tools described on this page can be obtained from: 1. John P. Fox Co., 5514 York Blvd., Los Angeles 42; 2. Fidelity Products Co., 2817 3rd St., N. W., Canton 8, Ohio; 3. Lund Mfg. Co., Biddeford, Me.; 4. J & L Tool Co., P.O. Box 82, Three Rivers, Mich.

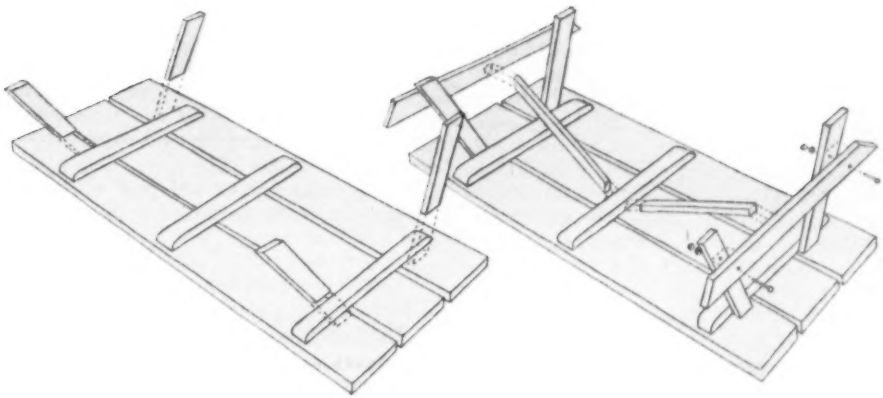
By Roy Doty and Darrell Huff

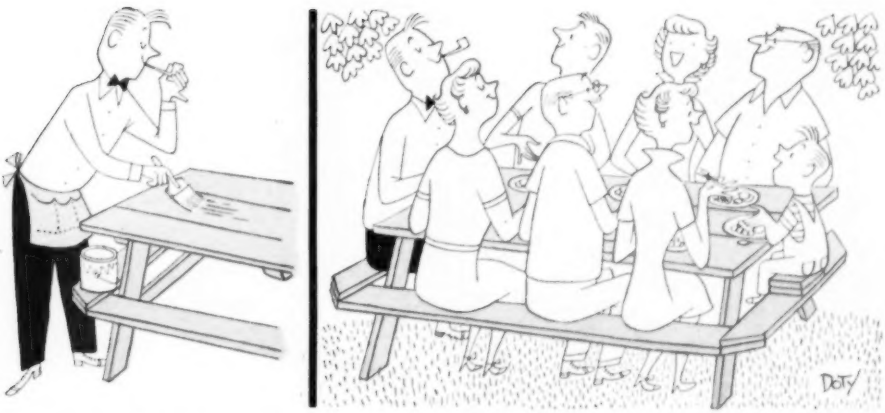
Wordless Workshop











Next Month: A single circle of wood makes a tricky plant stand.

Sit up to loll . . .

How to Build a Two-Way Lawn Chair

. . . lie back to relax.

By Darrell Huff

WANT a "chaise longue" that lets you sit up (sort of) or lie back (sort of) —neither, really—and is the essence of comfort? It's yours for the price of a little lumber, three hanks of clothesline and a minimum of effort.

You can use it indoors or on the lawn, porch or terrace. Leave it as it is, or upholster it. If you like, add a foam-rubber pad. In place of springs or the customary webbing, you use plastic clothesline, durable and inexpensive.

Pine's fine for a piece like this. The one described on these pages was built of redwood for its handsome color and resistance to weathering.

The lumber needed is 14′ 4″ of stock 1¾″ thick and 5¾″ wide. This is bought most easily as two two-by-sixes 8′ long. If you prefer a hardwood, a thickness of 1¼″ to 1½″ will do.

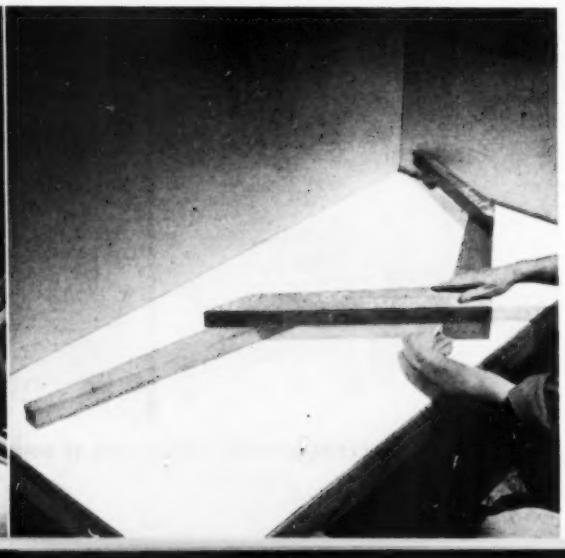
For pine, you will need oval- or round-head screws in two sizes—42 No. 8's 1½″ long and eight No. 12's 2¼″ long. You will also need eight No. 8 flathead screws 1½″ long. Temporary assembly will require three dozen extras of this size.

Finally, scrounge around your workshop for a scrap of one-by-ten clean board that is at least 19¼″ long.

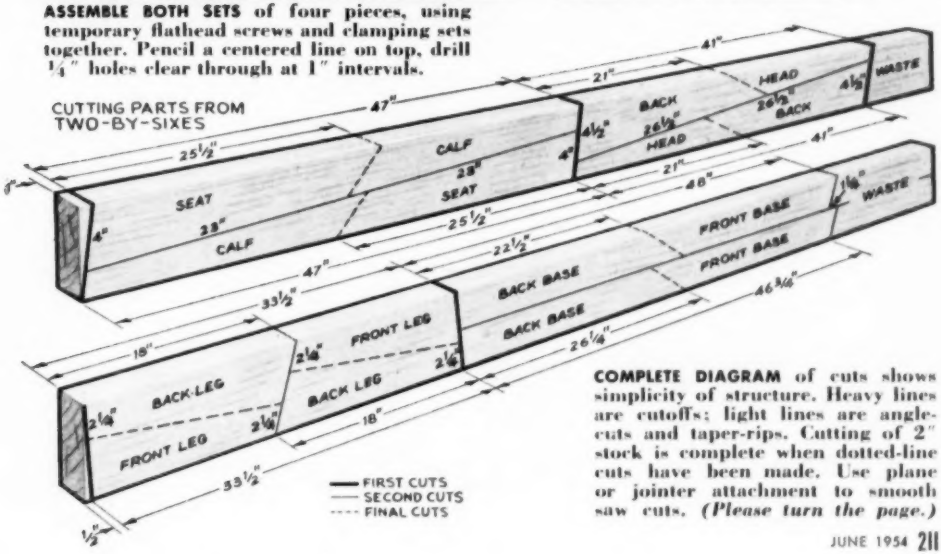
Be sure the hanks of clothesline are connected. You should have at least 125 unbroken feet of line.

MAKE ALL CUTOFFS first (see diagram on facing page), then angle-cuts and taper-rips. Jig would simplify freehand taper pictured here. Make cuts for one side of chair reverse of other side, of course. Lumber needed for this chair can be hauled in a car.

LAP JOINTS are made easiest by laying the pieces out on the bench for marking. Here, in order left to right, are the calf, seat, back and head. Draw lines for the joints on both pieces at each lap. It's a good idea to chalk names on all parts for quick identification.

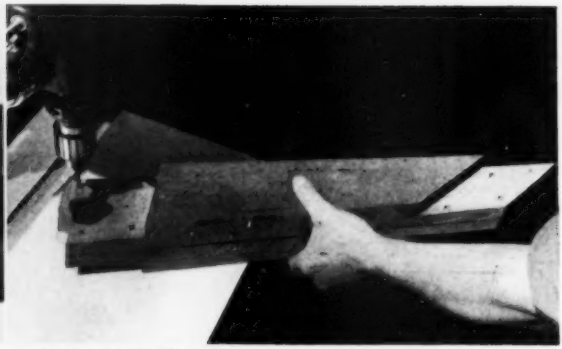


ASSEMBLE BOTH SETS of four pieces, using temporary flathead screws and clamping sets together. Pencil a centered line on top, drill ¼" holes clear through at 1" intervals.

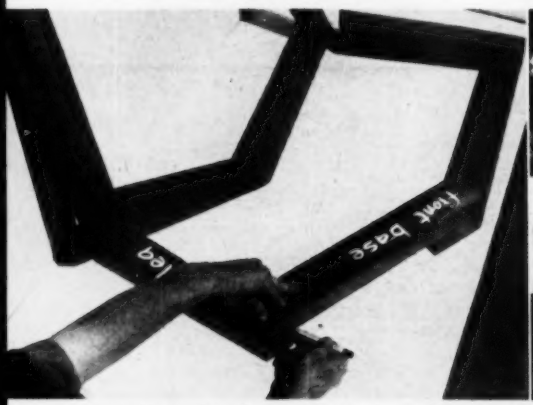


COMPLETE DIAGRAM of cuts shows simplicity of structure. Heavy lines are cutoffs; light lines are angle-cuts and taper-rips. Cutting of 2" stock is complete when dotted-line cuts have been made. Use plane or jointer attachment to smooth saw cuts. *(Please turn the page.)*

AS THIS CLOSE-UP SHOWS, some joints won't be perfect laps. Just make sure that corners line up. Excess wood sticking out in dog ear can be trimmed off after assembly.

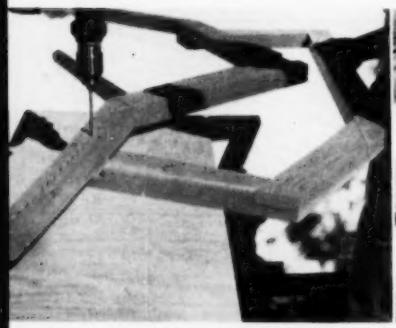


DRILL HOLES like this to take your 1½" screws. Drill four holes at each end of the seat pieces and at the fat ends of the head pieces. Your stock, of course, should be dry.

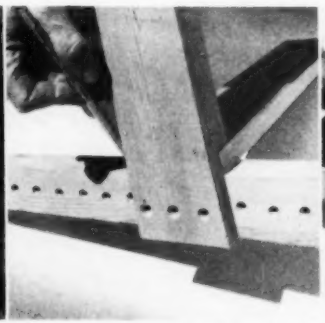


NOW ASSEMBLE leg and base pieces. Make one set reverse of other, as with first assembly. Mark and cut lap joints and dry-assemble with flathead screws at the joints.

LAY OUT one assembly of each kind this way, screwheads up, with back legs at head end of main assembly. Mark lines for cuts and saw lap joints half-through both legs.



WITH JOINTS COMPLETE, reassemble unit, using pair of long screws at each joint. Wherever ¼" holes are blocked by an undrilled leg, drill the holes on through.



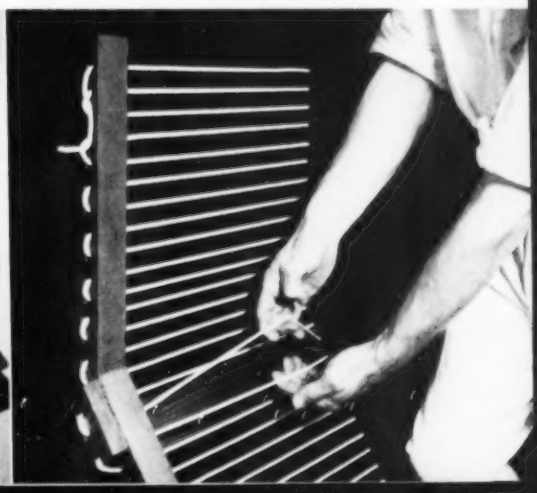
CUT ONE-BY-TEN to length of 19¼", rip to fit back-leg notches. Mark position of stretcher pieces on main assembly. Then make and mark stretcher for the front legs.

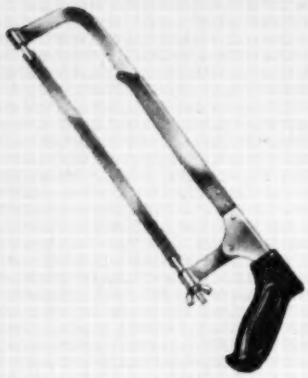
FROM REST OF ONE-BY-TEN make center stretcher to fit notches. Fasten the three stretchers into place with flathead screws. Use 2¼" screws on the leg assembly.

Completed chair is an ideal place to take a summer snooze, to read—or even to sun-bathe.

MARK NEARLY COMPLETE FRAME for any trimming necessary. Then take apart and reassemble permanently, using glue on joints. Use eight flathead screws in front and rear stretchers, two at each joint. Use two 2¼" screws at each joint between leg and assembly, oval- or roundhead screws elsewhere.

THREAD IN PLASTIC clothesline and secure it by slipping end under a couple of loops, as shown here. Tighten by working slack from middle toward ends. Use a hand-to-hand motion, pulling until cord is taut. If it loosens with constant use, it can be retightened quickly and easily this way. END





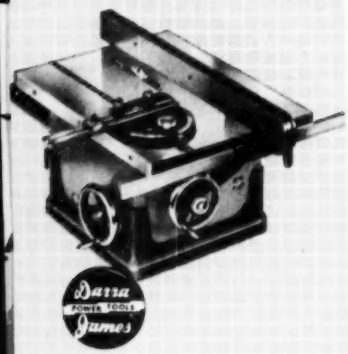
Cuts in all 4 directions in metal, plastic, etc. Hacksaw adjusts for blades from 8" to 12"...cuts 2¾" deep. Perfectly balanced frame of heavy, nickel-plated steel. Rust-resistant. Shockproof handle... comfortable, pistol-grip design. With 10" blade. (4HR4156) **$1.25**
Others from ..... **77¢ to $2.25**

Delivers smooth, quiet flow of power longer. Wizard V-belt is perfectly balanced... holds peak efficiency with fewer adjustments. Powerful cable cords, preheated in liquid rubber and locked in non-heat-generating cushion stock. Double service jacket. 22" to 100". (2HR1922-88)... **61¢ to $2.69**

Gives a "piano" finish to rough wood, metal surfaces. Speedway Speedsander ends tiresome hand sanding, polishing. Powerful direct drive ball-bearing motor. "Natural" orbital motion—3450 times a minute! Uses any sheet abrasive. Lightweight aluminum housing. (2HX1140) **$34.50**

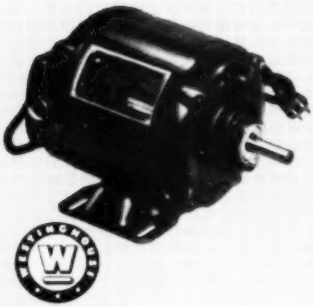
The Pick of America's Finest

Save time, save work... do it



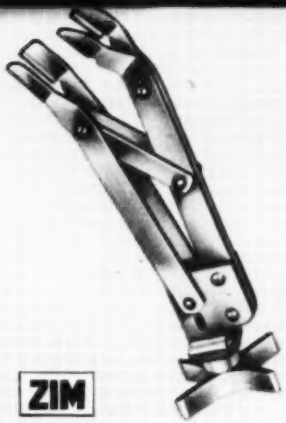
Delivers steady, high speed, vibration-free performance with the precision accuracy demanded by skilled craftsmen. Darra-James tilt arbor saw has big (16"x20") Blanchard ground iron table. Cast iron miter gauge. Self-aligning rip fence. Cuts 2⅝" deep. 8" comb. blade. (2HW1004) **$84.95**

Makes tough turning jobs easy. Wizard "Circle-Grip" plier's deep milled channels give 5 easier, positive adjustments. Jaws always parallel for wrench-like action on nuts, bolts, fittings. Long knurled handles give extra leverage for powerful, non-slip grip. Chrome-plated alloy steel. (HR1204) **$2.65**

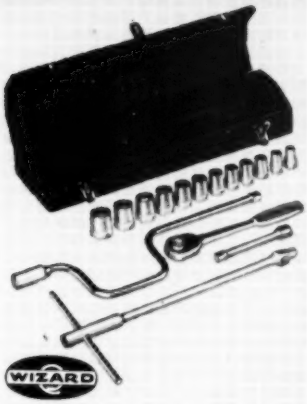


Smooth, long-lasting power for drill press and other vertical applications. Can also use 1/3 H. P. Westinghouse split-phase motor horizontally for saws, lathes, etc. Sleeve bearings, nylon thrust washers. Moisture-resistant windings. 1725 rpm. 115 v., 60 cyc. A.C. 1-yr. warranty. (2HI601) **$19.50**

Choose from over 1,100 professional quality power and



Mechanic's choice. Zim combination valve and spring compressor has high-lift, parallel-acting adjustable jaws for greater adaptability. Hand wheel turns for either compressing or lifting a spring . . . holds automatically at any point. Heavily built—practically unbreakable. (4H93106) **$3.29**



Chrome-plated alloy steel sockets (hot broached, with uniform tapered walls) easily tighten a wide range of nuts, bolts at any angle. Wizard 17-pc. set includes twelve 12-pt. sockets, 7/16" to 1"; T-Flex and speeder handles; extension; crossbar; ratchet. ½" square drive. (H82951) **$19.95**

No filling, no spilling...no priming, no pumping. Instant lighting Bernz-O-Matic is perfect, easy-to-handle torch for soldering, paint burning, body and fender work, etc. Lightweight—weighs only 2¼ lbs. With long-lasting fuel cylinder. (4H84420) **$6.95**
Refill cylinder (4H84421) **$1.95**

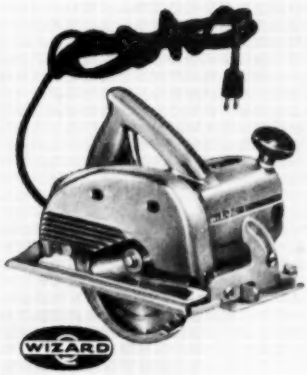
"Do it Yourself" Tools . . . at Western Auto

STORES AND ASSOCIATE STORES

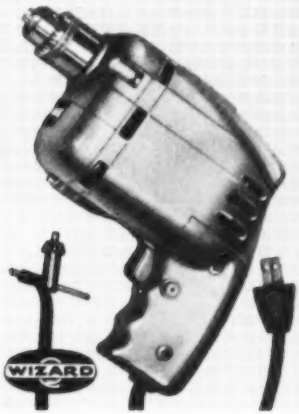
easier, faster, better . . . and save

NOTE: Western Auto Associate dealers own their stores and set their own prices, terms and conditions. Prices may vary due to differences in local conditions. If you do not know the location of your nearest Western Auto Store, write Western Auto Supply Co., 2107 Grand, Kansas City, Mo. (PS6A)

All-purpose screwdriver set. 5 hardened forged steel blades snap snugly into oversize Tenite handle. Includes ¼" slotted bit for general use, Nos. 1 & 2 Phillips screw bits, plus two sizes clutch head bits. Dozens of uses around the home, garage, shop. In handy wrap-up plastic case. (H81310) **$1.98**

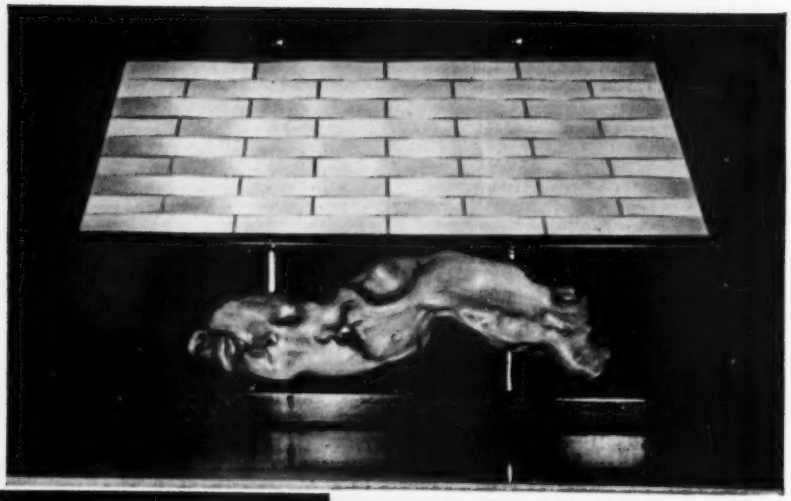


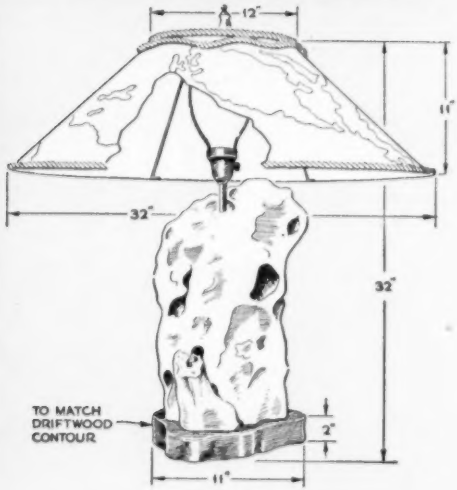
Makes fast work of heavy sawing . . . saves hours of effort. Wizard Zip-saw has 6¼" combination blade . . . rips or crosscuts to 2⅛" depth, bevel cuts to 45°. Adjustable rip guide. Precision-cut bronze gears. Lightweight aluminum housing. 110-120 volt, AC-DC motor. (2H1082) **$36.75**

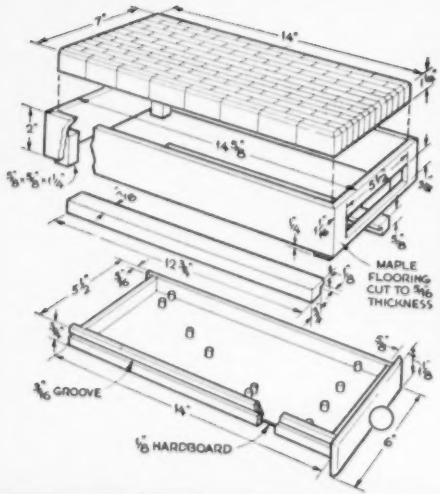


Handful of power! Wizard ¼" electric drill (famous Fairchild quality) is almost impossible to stall—even in rugged use. Compact, lightweight—less than 4 lbs. Geared key chuck. Lock-type, instant-release trigger switch. Full 2-amp motor for efficient, vibration-free power. (2H1374) **$23.95**

hand tools . . . see your Western Auto man this week.




12"
11"
32"
32"
TO MATCH
DRIFTWOOD
CONTOUR
2"
11"


7"
14"
2"
14 3/8"
5 1/2"
12 3/8"
5 1/2"
MAPLE
FLOORING
CUT TO 3/16
THICKNESS
GROOVE
14"
1/8 HARDBOARD
6"

Driftwood Lamps Dress Up a Room

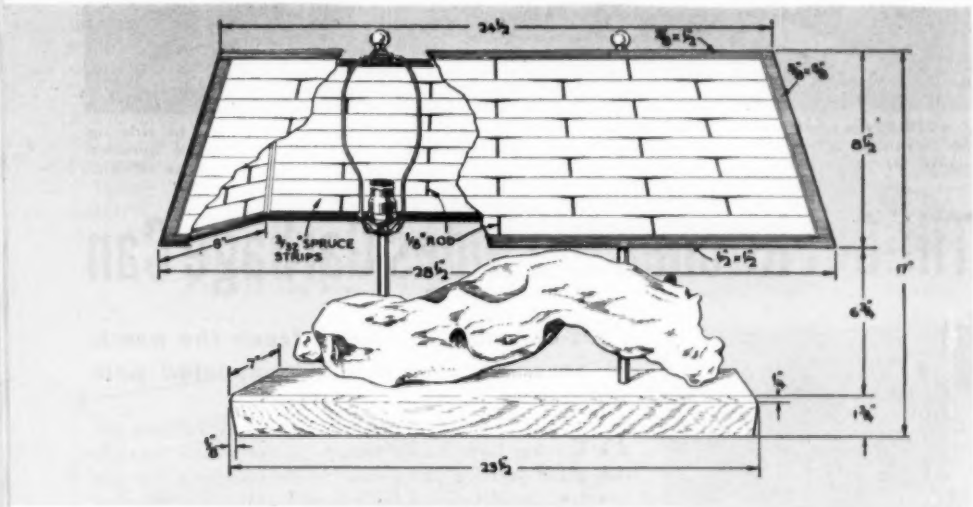
You can round up materials at the seashore this summer and then put them aside to dry for projects like these in fall and winter months.

DRIFTWOOD is where you find it—like gold. And the prices you pay for such objects suggest that gnarled wood is actually second cousin to a precious metal.

Select a piece to suit your purpose and cut it, if necessary, for the best possible configuration. Rapid drying in the sun or near the furnace will produce checks that may improve its appearance. Sand the piece smooth and clean the crevices and knotholes with steel wool or a flexible-shaft tool. Screw the driftwood to an appropriate base and drill holes for the lamp supports.

After a trial fitting, separate the parts and apply wood bleach to the driftwood. When dry, coat it with dull bleaching lacquer.

Shades made from charts or thin wood strips woven over a welding-rod frame blend well with driftwood bases.—*Vern Forsberg, Seattle, Wash.*



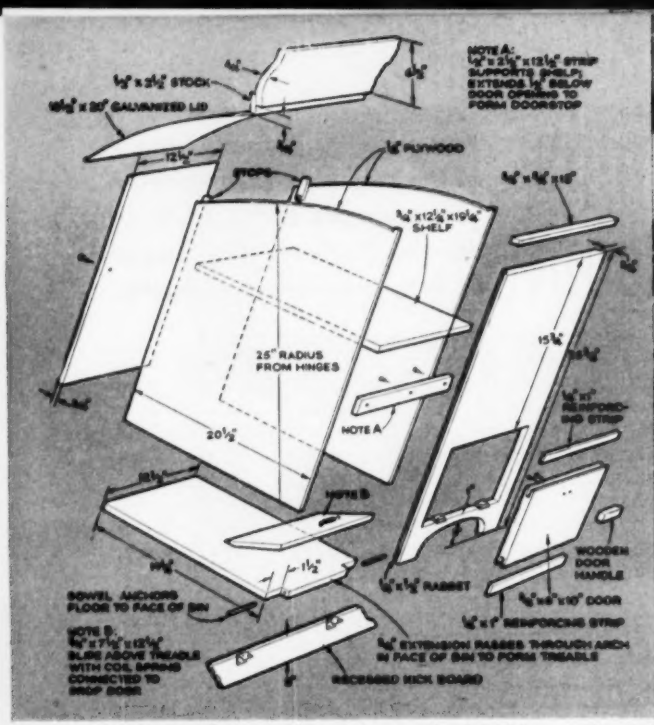
Cutting Board Stores Knives, Too

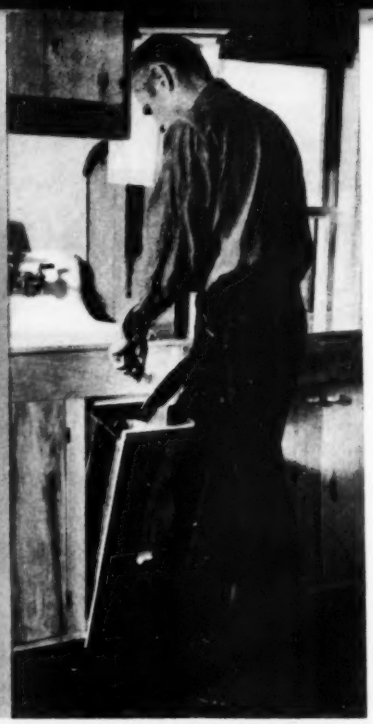
AN ASSORTMENT of knives for cutting and chopping is always at hand for use on the cutting board at the left. They are stored in a drawer fitted in its base.

Glue the four sides of the base together and add legs projecting about ¾" below it. The legs also reinforce the corners. Cut a shallow rabbet in two strips for the drawer guides, leaving a ⅜" tongue to ride in a 3/16" groove which is cut in each side of the drawer.

Assemble the drawer with brads and glue. Arrange short pieces of ½" dowel in it to suit the knives and tack them in place from below. Finish with lacquer or varnish.

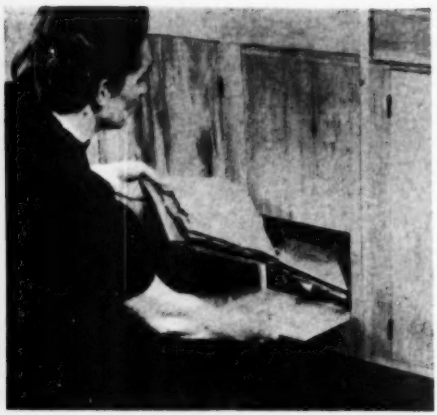
Cut short scraps of maple flooring into little blocks and glue them together with the rows staggered like courses of brick. Plane the top smooth and trim the sides to fit into the open top of the base. Rub the cutting board with a rag dipped in hot paraffin to seal the wood.





HINGED BIN is sized to fit in standard 24"-by-36" counter, but width and middle-shelf position can be varied to suit space, size of can. Metal lid must be carefully cut to ride on edges of bin so it can't fall down between them. Cleat on floor supports rear of bin.

Tilt-Out Kitchen Bin Hides Garbage Can



EXTRA BAGS are kept handy in compartment below pail. Small coil spring holds door tightly shut. Separate strip across top edge of bin could be omitted for simplicity, but it helps prevent warping due to extra moisture in the garbage compartment.

Foot-operated disposer frees the hands to scrape waste into a concealed pail.

A TOUCH of the toe tilts out this hinged rubbish bin, leaving both hands free to scrape waste into the concealed garbage pail inside. As the bin closes, the pail is automatically closed by a sheet-metal cover attached to the inside edge of the counter face, sealing in odors and eliminating the need for a separate lid on the pail. A second compartment below the pail stores extra garbage bags.

The bin, which makes use of part of the under-sink waste space, can be made of 1" stock glued up or ¾" plywood, as shown in the sketch, with ¼" plywood for the curved side pieces. To cut the curves, strike an arc from the hinge point to the top of the bin with a pencil and piece of string. Stop strips screwed to the rear corners keep the bin from swinging all the way out, but they can be pivoted aside to permit occasional cleaning behind it.

Hinging the bin at the top of the kick board provides a natural pivot point, easily controlled by light foot pressure.—*John D. Bell, Minneapolis.*

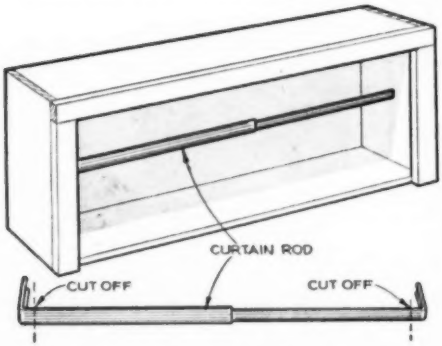
Could You Build This Trick Lamp?

Three bulbs joined end to end, will make your friends stop, look and wonder how it's done.

If you like unusual projects, here's one for you. On first seeing this odd lamp, anyone with normal curiosity is sure to do a double take. The lamp doesn't seem believable. But it is. It works just as well as any other lamp. The fun you'll have with it will more than repay you for the few hours needed to put it together.

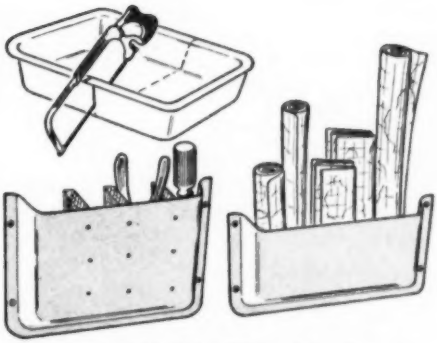
Before you read how to build it, can you figure how it works?

Please turn the page to see how.



Curtain Rod Makes Inside Rule

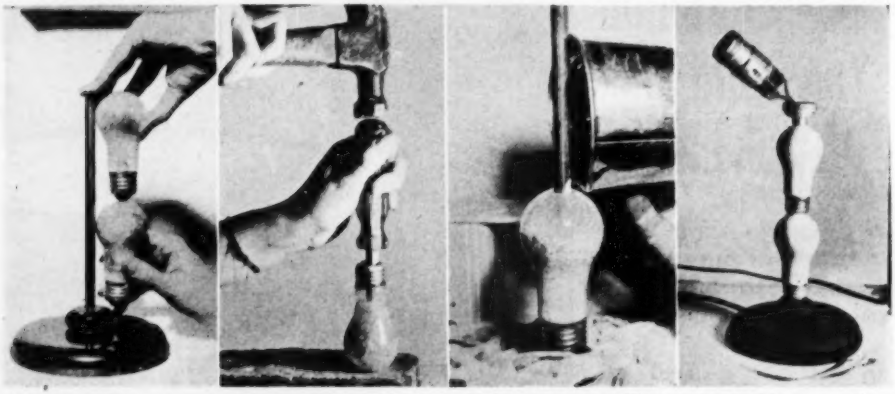
Measuring inside dimensions is easy with a telescoping curtain rod. Cut off the curved ends, stretch out the rod to fit, then transfer it to the work or to a regular rule to get the proper measurement.—*V. H. Lamoy, Upper Jay, N.Y.*



Cake Pan Holds Shop Tools

An aluminum cake pan, cut off at one end and screwed to a shop wall through the flange, makes a fine storage pocket for sandpaper and other flat sheets. Wood dividers can be added to make pockets for tools.—*Norm Jacky, Fond du Lac, Wis.*

Photoflash Bulbs Are the Secret of This Unusual Lamp



HOLLOW PIPE to carry the wire should be slightly longer than two flash bulbs.

HOLE IS PUNCHED in end of bulb with a screwdriver after base is cut out.

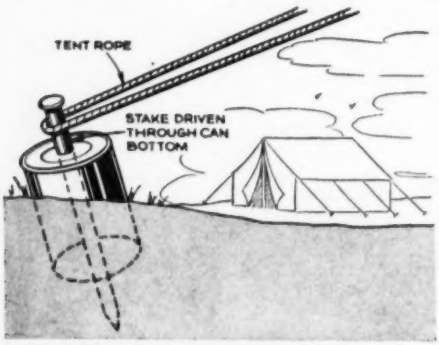
BOTTOM BULB is filled with watery plaster of Paris after being slipped on pipe.

SOCKET is screwed on top of pipe and wires are run down inside it to complete lamp.

An ordinary light bulb would break into a thousand pieces if you tried to punch a hole in it. But using a photoflash bulb, which has a protective coating, you can punch the hole—and still keep the bulb intact.

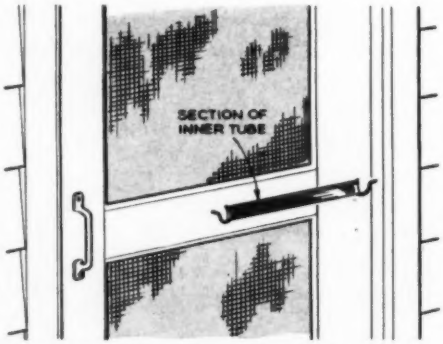
That's how the two bottom bulbs were added to this lamp. A sharp knife was used to dig the insulation out of the base and chip out the wires. Then a screwdriver was used to chisel a hole through the top, the hole being made just a bit larger than the hollow standard over which the bulbs were to go.

After the bottom bulb had been cemented to the base, a watery mixture of plaster of Paris was poured into the bulb. A second bulb was added in the same way. Both were then coated with white enamel.—*Clarence Leino, West Allis, Wis.*



Cans Strengthen Tent Stakes

If you have to pitch a tent on sandy or other loose soil, you can make the guy stakes grip tightly this way. Drive a tin can into the soil first, bottom up, then drive the stake down through the can and it will stay put.—*H. E. Moody, Upper Jay, N.Y.*



Inner Tube Makes Door Spring

A narrow section cut from an inner tube can be used to keep a door closed on a shed, shop or garage. Screw a hook into the jamb, then stretch out the rubber to see where the other hook should go on the door.—*V. H. Lamoy, Upper Jay, N.Y.*

TAKE Vacation Pictures

ANYTIME... ANYWHERE... WITH SIMPLE PHOTO AIDS

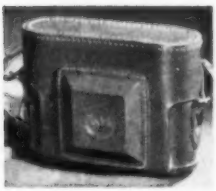
No need to miss out on any snapshots you want this summer. The inexpensive Kodak aids shown below can help you make good pictures day or night . . . indoors or out. They're easy to use . . . compact and handy. See them at your Kodak dealer's.

Flash is easy—Kodalite Flasholder (with Lumaclad reflector) for Brownie Hawkeye, Flash Model, and Kodak Duaflex III Cameras. $4.

Dependable flash everytime with Kodak B-C Flasholder, $9.95. Or use Kodak B-C Flashpack (inset, $2.95) in Kodak Standard Flasholder, $7.95.

For "close-ups" with most fixed-focus cameras, the Kodak Close-up Attachment, $1.63. Kodak Cloud Filter ($1.85) brings out clouds.

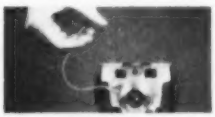
For dramatic shots—Kodak Wratten Filters (from $1.75) fit most every camera; easiest way to improve both your black-and-white and color shots.



A "must"—Handsome Kodak carrying cases protect cameras, make them easy to carry. From $2.65.

To support camera and flash unit, attach to most any surface with sturdy Kodak Flexiclamp. Only $4.95.

Get into your picture—Kodak Auto-Release trips shutter automatically at intervals up to 10 seconds. $3.86.



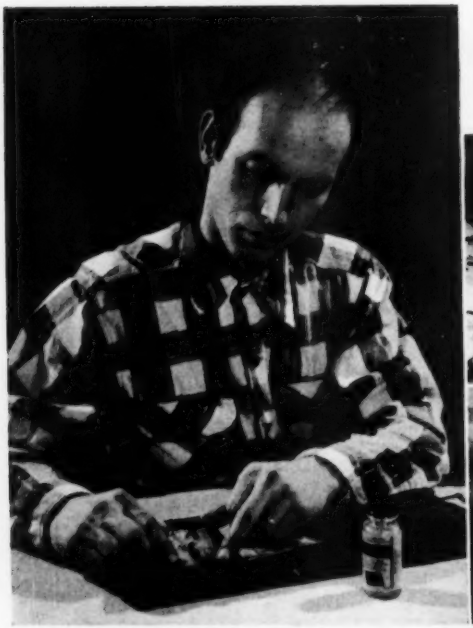
Aid steady shooting—Kodak Metal Cable Releases fit most cameras having cable release sockets. Will not kink. From $1.05.

Prices subject to change without notice

Eastman Kodak Company, Rochester 4, N. Y.

Kodak

Adhesive You Can Use and Use Again



A NEW latex adhesive produces a self-sticking surface on paper, cardboard or other material. The coated object can even be pulled off and restuck again and again. Here are some uses.

Photos or stamps mounted in an album with it can be peeled free and arranged in a new grouping without additional adhesive or damage to photos or album.

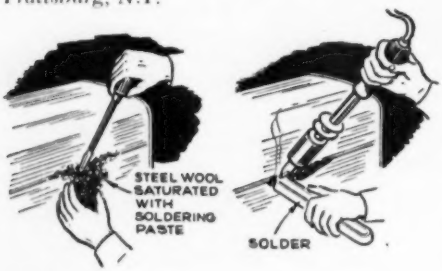
You can wrap a gift like an expert without either tape or string. Just apply the adhesive to the paper edges and they stick right where you put them. Removal leaves no mark.

If you are running an electric cord around the baseboard, you can forget about staples. Coat the cord, then stick it neatly to the top of the board.

The bottled adhesive is a product of Bienco Distributing Co., Costa, Mesa, Calif.

Steel Wool Holds Solder Joint

WHILE doing some sheet-metal work, I encountered a joint that was too far apart to solder. After applying flux to a clean piece of fine steel wool, I wadded it into the seam, trimmed off the excess, fluxed the adjoining metal and flowed solder into and around the wool with my iron.—*J. H. Seval, Prattsburg, N.Y.*



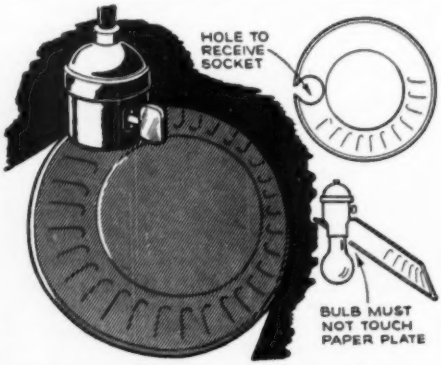


Plate Is Emergency Reflector

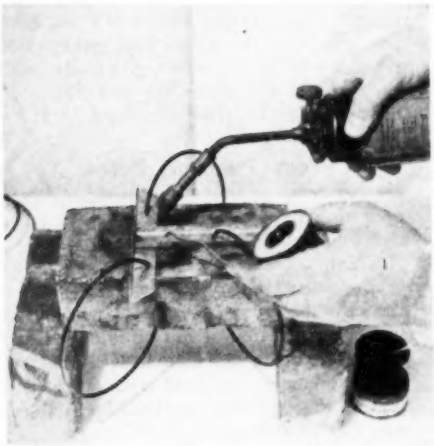
A PAPER picnic plate can be used like this as an emergency reflector for an unshielded light bulb. Cut a hole in the plate so it is a snug fit on the socket.

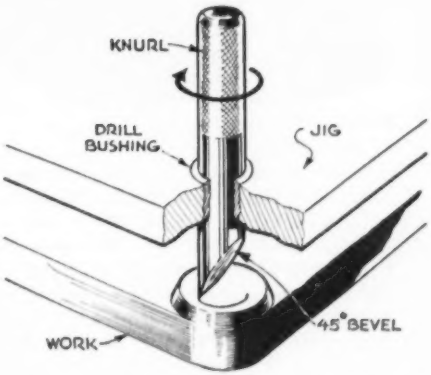
NEW Shop Ideas

Cutting Rings in a Lathe. When special rings must be cut from solid stock, this trepanning dodge beats boring the inside.

Turn to outside diameter. Then mount a hole saw of the desired inside ring diameter in the tailstock chuck, leaving out the center drill. Use a low spindle speed and run the saw in with the tailstock feed, backing it frequently to let chips clear themselves. Then withdraw the saw as in the photo and cut off the rings with a parting tool. A solid core of material is left, instead of a pile of chips.—*Mac Mackson, Ridgewood, N. J.*

Spring soldering clamps. Unless parts to be soldered or brazed are firmly held, they may shift before the job is done. Ordinary C clamps get in the way and draw too much heat from the work besides. The big clips below, cut from old mattress springs, have a small contact area and so absorb little heat. They apply enough pressure to hold the parts firmly, while leaving them free for any necessary adjustment.

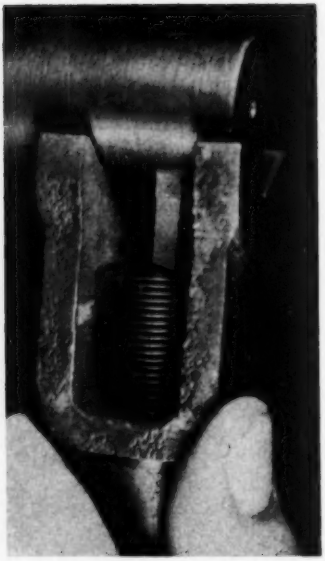


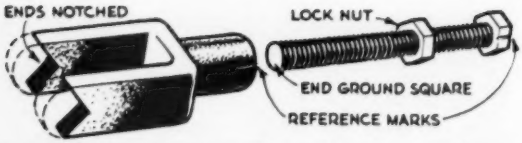


Scribers Test Jig Setup. To check the accuracy of drill jigs, one toolmaker uses scribers made to fit the holes in the jigs. They are inserted and turned with the fingers to scribe circles on the work. This way the jig can be corrected in any necessary detail before a piece is actually drilled and perhaps spoiled.

The scribers are cut from drill rod to a length affording a finger grip, and knurled at one end. The other is cut at 45°, filed sharp at the tip, hardened and tempered.—*Henry Sevcik, Hawthorne, Calif.*

Please turn the page for more shop tips.



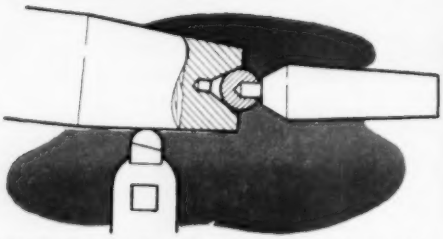


Tool-Resetting Gauge. When replacing or resharpening a bit in a boring bar or fly cutter during a job, you can reset it to the same position with this simple gauge, and avoid the need for making extra trial cuts.

I made the gauge from a small clevis by cutting V notches in the forked end. A nut was turned onto a bolt that fitted the other end, the bolt screwed in and locked with the nut, and its end ground square.

In use, the gauge is held against the tool body, the screw turned in until it touches the bit, and locked. To reset the tool after it has been taken out, the gauge is held as before and the bit pushed out until it touches the end of the screw.

By filing marks on the clevis and the bolthead, and determining the pitch of the screw threads, you can make surprisingly accurate tool adjustments.—*Phil McCafferty, Fort Bliss, Tex.*



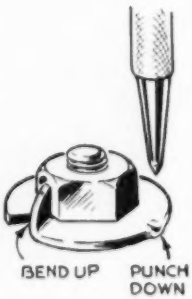
Ball Center for Tapers. Although turning tapers with the tailstock set over is standard practice, accuracy is limited because the cone center cannot seat truly in the work.

The ball center shown gives a full bearing surface no matter what the work angle. To make it, anneal a steel bearing ball, drill half through, and reharden it. Push it onto a stud turned on the end of a soft center. Centerdrill work deeply enough to engage the ball.—*Irving Salzer, Baldwin, N.Y.*

Clips Keep It Handy. Note and order books, tables and so forth do not fare well mixed in with tools. Spring-type paper clips bolted underneath a toolbox lid will keep such items clean and safe.

Two clips make it easy to carry a small mirror, a very useful item when you have to see around a corner or into tight spots to reach a part or find a dropped piece, and indispensable for removing something from the eye.—*Gus W. Hall, Brooklyn, N. Y.*

Bent Washer Locks Nut. A simple emergency lock washer can be made by slitting a flat washer and bending it up against the nut. To keep the washer from turning, punch a bit of its edge into a hole in the work.—*Federico Strasser, Santiago de Chile.*



Drill Press Punches Holes. You get cleaner holes in thin sheet metal or fiber by punching than by drilling, but the job can still be done in the drill press.

Clamp a piece of ⅛" flat steel to the drill-press table and drill a hole the desired size through it. Grind one end of a bit of drill rod or even a nail of the same diameter flat at a slight angle. Chuck this and, with power off, feed the quill down to force the punch through the work.—*Elbert Robberson, Port Washington, N. Y.*

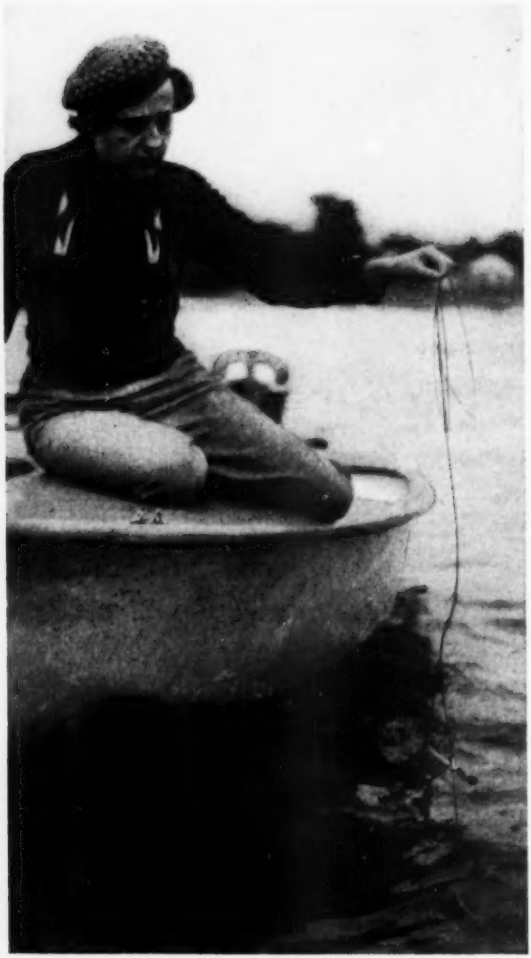
Advanced Chevrolet Engineering brings

MORE POWER AND GAS ECONOMY

with higher compression valve-in-head engines

Inhale—Squeeze—Burn—Exhale. That's what's done to the fuel mixture in the cylinders of your engine hundreds of times every second you drive. On the efficiency of this cycle depends the amount of power your engine develops and the amount of gasoline consumed in developing it. The famous efficiency of Chevrolet engines is the result of forty years of progress in valve-in-head design. Valve-in-head engines are more efficient because they draw more fuel mixture into the cylinders, retain more power-producing heat, and expel fumes more thoroughly and quickly. With Chevrolet's 7.5 to 1 compression ratio—highest in leading low-priced cars—the fuel is squeezed harder and the push of expanding gases on the pistons is more powerful. Chevrolet's dual automatic spark advance provides for ignition of the fuel precisely when it is required, and scientifically shaped combustion chambers assure smooth, knock-free burning—even with standard gasoline—with a blue flame that indicates complete combustion of the fuel. With Chevrolet engines, you get exceptional power for an extremely low operating cost. The "Blue Flame 115," used in gearshift models, develops 115 h.p. The "Blue Flame 125" teamed with Powerglide as an extra-cost option, develops 125 h.p. See your Chevrolet dealer. Try a Chevrolet with either engine. You'll like its fine performance and money-saving gas mileage. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

EVER FINER ENGINEERING CHEVROLET EVER FINER CHEVROLETS



Tin Fish Below Boat Warns of Shallows

This homemade sounding device pops up if it hits bottom. It may keep you from knocking a hole in the hull or winding the prop around a rock.

WITH this mechanical pilot fish swimming under your boat, you can cruise anywhere and never fear hitting bottom. Made from 10-cents' worth of materials, it is an adaptation of the Navy paravane, or underwater kite, used to cut mine cables.

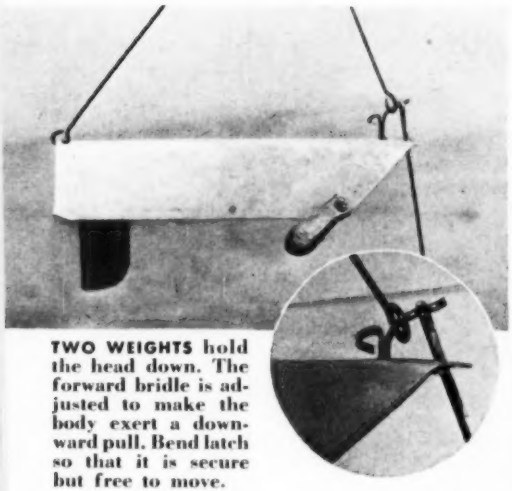
It can be set to stream at speeds of two to 10 knots, about as fast as you'd want to navigate unfamiliar waters. As long as all is clear at the depth it is set for, it stays under water. But if the feeler strikes bottom, the gadget flips over and streaks to the surface to warn you of danger below.

Cut the body and rudder from sheet brass or aluminum. Drill No. 6 holes where indicated. Bend both members along the dotted lines. Rivet the rudder on; then bend it farther until it bisects the wing angle. Make the other parts as shown in the photos.

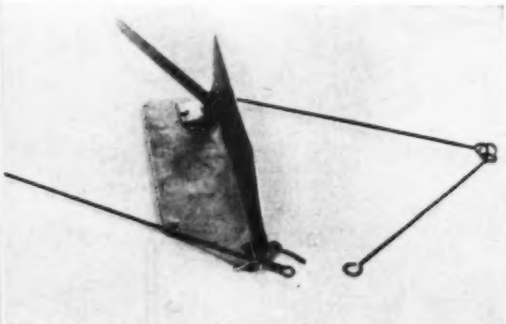
The device can be painted a bright yellow or vermilion to make it easier to spot. Attach a swivel to the ring linking the two bridle wires. A length of Monel leader wire, which should be 1½ times as long as the depth at which you want warning, makes the best cable.

Set the feeler on the latch and, when under way, drop the paravane in from the forward part of the boat. The end of the bowsprit is the best spot on a sailboat, but any point off the bow will do, as long as the device will be instantly visible to the helmsman or lookout if it surfaces. An oar or boat hook can be used to hold the cable out from the hull.

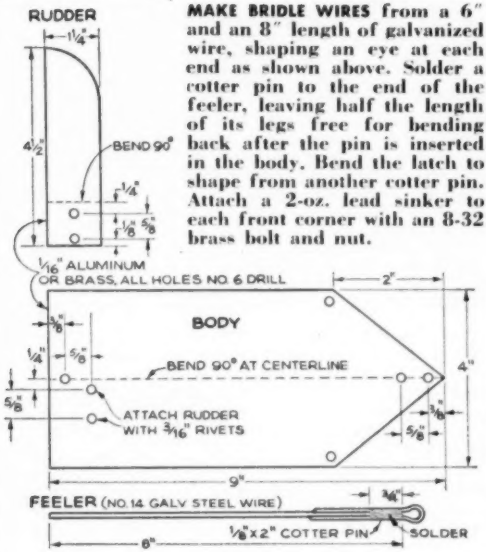
Be careful not to let the first contact with the water trip the latch. Watch the paravane when it is just below the surface; it should stream back at about 45° and with a downward pull of two to 10 lb. If it tends to dive or leap, change its angle by shortening or lengthening the front bridle wire a little at a time. Then drop it to cable depth and your 10-cent sonar is on the job.—*Elbert Robberson, Port Washington, N.Y.*



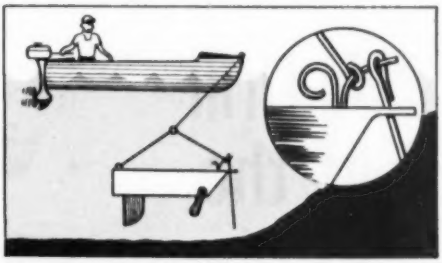
TWO WEIGHTS hold the head down. The forward bridle is adjusted to make the body exert a downward pull. Bend latch so that it is secure but free to move.



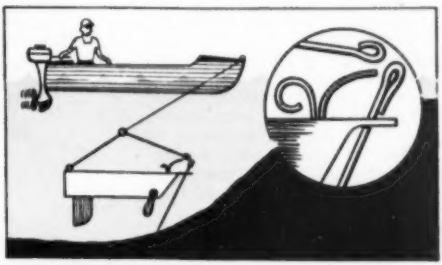
MAKE BRIDLE WIRES from a 6" and an 8" length of galvanized wire, shaping an eye at each end as shown above. Solder a cotter pin to the end of the feeler, leaving half the length of its legs free for bending back after the pin is inserted in the body. Bend the latch to shape from another cotter pin. Attach a 2-oz. lead sinker to each front corner with an 8-32 brass bolt and nut.



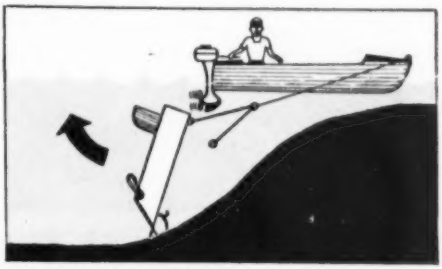
HOW IT WORKS



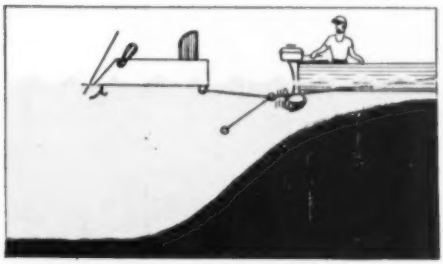
REAR BRIDLE WIRE is hooked fast. The front one is held on the latch by the eye on the feeler. Device streams like this, feeler down.



HITTING BOTTOM, feeler is kicked back. Its eye jumps forward, off the latch. With latch free to tip upward, front bridle slips off.



WEIGHTED FRONT DROPS, and paravane, now towed only by the rear bridle wire, instantly does a complete back flip in the water.

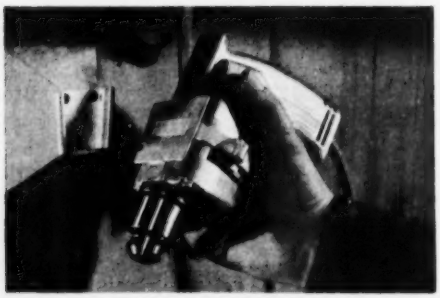


WINGS UP, the paravane now gets a lift from its movement through the water. It shoots up, skimming on the surface to warn the pilot.

Look what you can do with

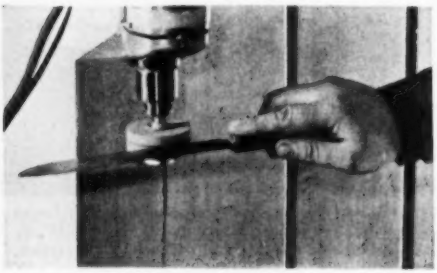
A Drill in the Kitchen

MOUNTED UNDER CABINET near sink, ¼" electric drill with buffer wheel will put a high shine on silver, chrome and copper ware. Fitted with wire cup brush, it also makes short work of pot-scouring chores. Use can-opener bracket to hold drill, as for wall clip below, but add spring cupboard latch (inset at right) to lock drill so it can't slide out.

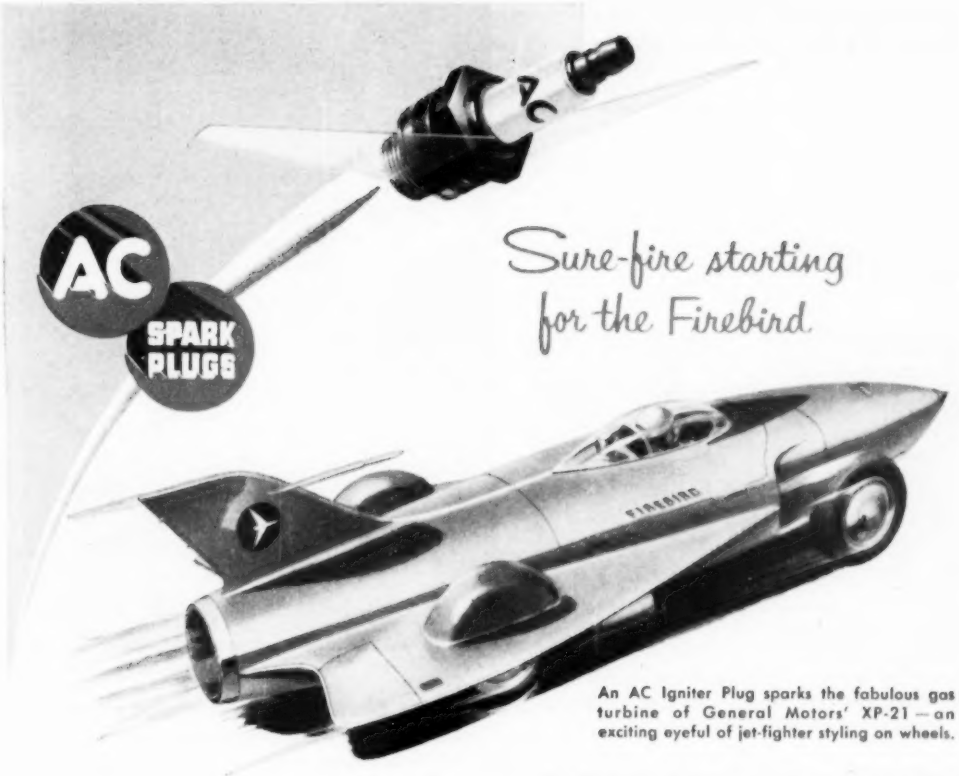


CAN-OPENER BRACKET makes simple slip-in clip to hold drill on wall. Bracket is mounted on 1¼"-thick wood block so mixer blade will clear wall. Metal plate on drill is hacksawed to shape of bracket from heavy sheet (cover plate from old electrical junction box is just right). Plate is then slotted and strapped on with large truck-type hose clamp.

COOL SUMMER MILK SHAKES are mixed in a jiffy with drill mounted on kitchen wall this way. Drill can also be used as hand mixer for beating eggs and batters in large bowls. Beater can be short rod bent at tip or small commercial impeller available at hardware stores.

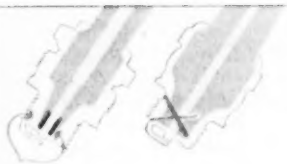


KNIFE SHARPENER puts a quick, keen edge on knives without hand grinding. Sharpener, made by Mall Tool Co., fits ¼" chucks, has a groove that you just slip knife into.



An AC Igniter Plug sparks the fabulous gas turbine of General Motors' XP-21 — an exciting eyeful of jet-fighter styling on wheels.

A new set of AC's brings easier starting and smoother firing to any car's engine



AC's longer, thinner insulator tip stays cleaner, boosts power, saves gas

AC's long, thin, recessed insulator tips heat up more rapidly to burn away deposits which would otherwise form at the tips to cause pre-ignition or misfiring. This is an exclusive AC feature.

Your car should start quickly, idle quietly, accelerate smoothly. If it isn't behaving like that, take a few minutes to have your spark plugs checked. If they're badly worn you'll find that a new set of AC Spark Plugs will go a long way toward restoring new-car performance — may give you up to 10% more power and fuel economy as much as one gallon in ten.

You see — AC Spark Plugs have many patented features that insure power-boosting, gas-saving, top-flight performance! And note: there's an AC Spark Plug engineered to General Motors standards specifically for the car *you* drive.

AC SPARK PLUG DIVISION GM GENERAL MOTORS CORPORATION

STANDARD FACTORY EQUIPMENT ON CHEVROLET • PONTIAC • OLDSMOBILE • BUICK • CADILLAC • GMC

Sliding Cover Protects the Lens of New Reflex Camera

A SLIDING lens shield is a feature of this new Anscoflex. Pushing up the slide simultaneously raises a folding light shield around the view finder. The reverse action closes the camera.

A built-in shutter lock prevents double exposures. The camera makes 12 2¼"-by-2¼" pictures on 620 film. A lock-on flash attachment comes as an accessory.

Photo Trays Rock on a Cord

A LENGTH of insulated electric wire (see arrow) placed under the middle of photographic enlarging trays makes it easy to keep the chemicals flowing back and forth just enough for rapid, even development. *—Harrison Neustadt, NYC.*

New Stereo Sets Own Exposure

A BUILT-IN exposure calculator is a feature of this new Kodak stereo camera. When you select the desired shutter speed, the calculator automatically sets the lens diaphragm for bright, hazy, or cloudy-bright lighting.

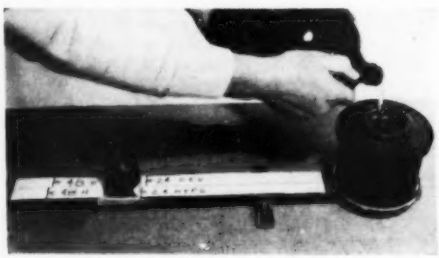
Eastman has also incorporated another aid to simplified photography in the camera. This is a distance indicator that provides focusing points for close-ups, groups and scenes. The camera will be marketed this summer.

Balance Measures Developer

INSTEAD of using a graduate to measure the developer needed for various film sizes in a roll-film tank, use the homemade balance below and just pour in the liquid.

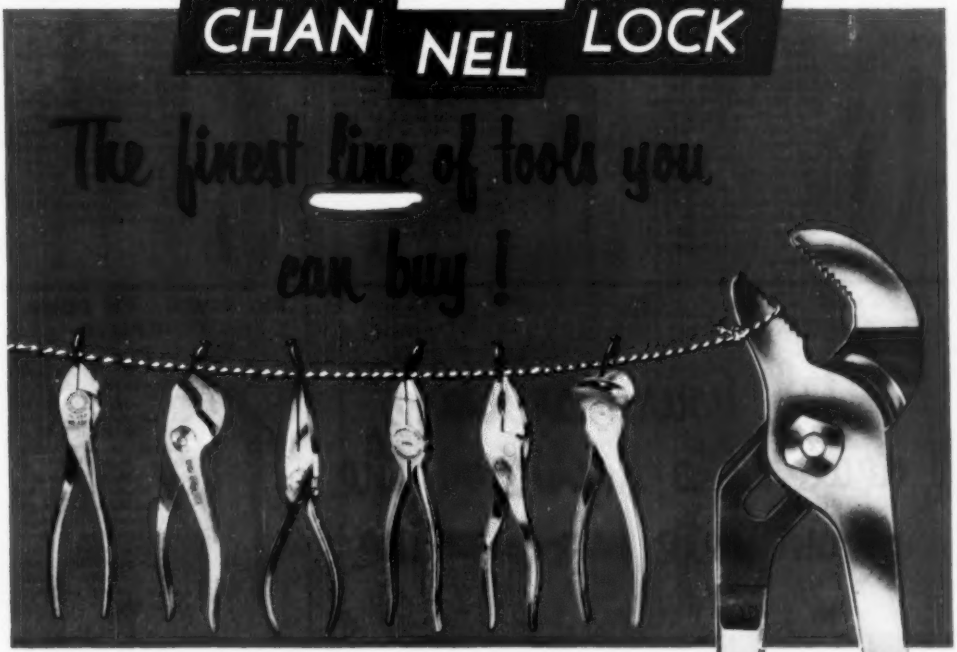
The balance was made from a piece of one-by-two stock with a coffee-can lid for a tray. A fulcrum was provided by screwing a piece of counter-edging to the bottom 6" from the tray center. Any piece of metal weighing about a pound will serve as a weight. It can be clamped in a tin-formed slipper moved along the top of the arm.

The arm must be calibrated experimentally for the desired amount of developer and hypo. As these have different specific gravities, a mark must be made for each. *—Elbert Robberson, Port Washington, N.Y.*



CHAN NEL LOCK

The finest line of tools you can buy!



YOU'LL find a complete selection of pliers in the Channellock line — a plier for every job . . . at work and in the home. Don't take a substitute when you shop for pliers — Only Champion DeArment make Channellock . . . patented features assure you of the finest line of tools you can buy.

THE PLIER DESIGN THAT OBSOLETES ALL OTHERS

CHAMPION DEARMENT TOOL CO.

MEADVILLE, PENNSYLVANIA

No. 407 GRIPPING PLIER

Length 7". Capacity 1/8" to 5/8". Two adjustments. Knurled grips.

This **No. 407** plier is primarily intended for battery work. The self-gripping feature insures a positive grip on acid corroded and mutilated terminal nuts. Its adjustable feature also makes it indispensable for many other kinds of work. Polished steel finish.

No. 410 GRIPPING PLIER

Length 9½". Capacity 3/16" to 1⅛". Four adjustments.

Our **No. 410** is a heavy-duty self-gripping plier which will hold work of any shape with a positive pipe wrench grip. Will exceed a pipe wrench in usefulness because of its light weight and streamlined design. Polished steel finish.

No. 417 GENERAL UTILITY PLIER

Length 7". Capacity ⅞". Three adjustments. Knurled grips.

The **No. 417** is a heavy-duty plier with a gripping power many times greater than the ordinary slip-joint plier. Polished steel finish. Its superiority can only be appreciated by actual use.

Ask your hardware dealer to show you the complete CHANNELLOCK line

The NEW No. 420 PUMP PLIER

Length 9½". Capacity 1¾". Five adjustments.

The wide range of adjustments of the **No. 420** Pump Plier makes it adaptable to a multitude of uses. New strength has been added by the patented design of the tension edge. Interlocking channels and lugs prevent slipping. Wide base lugs provide maximum cross section strength.

SELECT THE PLIER YOU NEED

No. 424 IGNITION PLIER

Length 4½". Capacity ½". Four adjustments.

This **No. 424** ignition plier incorporates the Channellock adjustment feature in order to eliminate wear on the joint bolt and lengthen the life of the tool. A midget plier. Polished steel finish.

No. 307 BATTERY PLIER LAP JOINT

Length 7". Capacity ¼" to 5/8". Blue finish.

No. 317½ LONG NOSE PLIER with Side-Cutter

Length 7½". Polished steel finish. Knurled grips. **No. 3017½** same model without side cutter. Point, 3/32" round.

No. 326 LONG NOSE PLIER with Side-Cutter

Length 6". Polished steel finish. Knurled grips. **No. 3026,** same model without side-cutter. Point 3/32" round.

No. 337 DIAGONAL CUTTING PLIER Lap Joint

Length 7". Weight 6 lbs. per doz. Polished steel finish. Knurled grips.

No. 348½ LINEMEN'S PLIER Rounded Nose

Polished steel finish. Knurled grips. Side-cutter.

No.	Size
346	6"
347	7"
348½	8½"

Only CHAMPION DEARMENT MAKES CHANNELLOCK

No. 3048½ LINEMEN'S
Bevel Nose

Polished steel finish. Knurled grips. Side-cutter.

No.	Size
3046	6"
3047	7"
3048½	8½"

No. 356 END CUTTER

Length 6". Polished steel finish.

No. 366 FLAT-NOSE PLIER
with Side-Cutter

Length 6". Polished steel finish. Knurled grips. **No. 3066,** same model without side-cutter.

No. 378 LONG REACH DUCK-BILL PLIER

Length 8". Polished steel finish.

No. 3078 LONG REACH NEEDLE-NOSE PLIER

Length 8". Polished steel finish.

No. 436 DIAGONAL CUTTING PLIER
Box Joint

Length 6". Polished steel finish. Knurled grips. **No. 435,** same model 5" long.

HE WILL HAVE ONE FOR EVERY JOB

No. 437 DIAGONAL CUTTING PLIER
Box Joint

Length 7". Polished steel finish. Knurled grips. A popular plier with automobile and airplane mechanics.

No. 447 CURVED DIAGONAL CUTTING PLIER
Lap Joint

Length 7". Polished steel finish.

No. 516 SLIP-JOINT PLIER
Thin Nose

Length 6". Polished steel finish. Knurled grips.

No. 537 SLIP-JOINT PLIER
with Side-Cutter

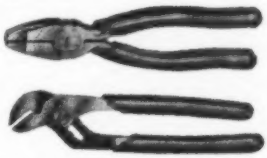
Length 7". Polished steel finish. Knurled grips.

No. 568 ANGLE-NOSE PLIER
Slip-Joint

Length 8". Polished steel finish. Knurled grips.

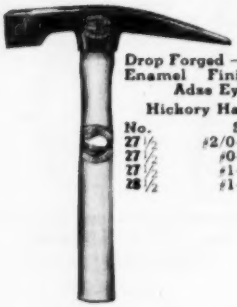
"SUPERIOR" PLASTIC GRIPS FOR PLIERS

Made of tough, durable plastic material. Easy to install, full instructions with each pair. Plier loss reduced as light blue color makes pliers easy to locate Gives maximum handle-grip comfort.



CHAMPION DEARMENT TOOL CO • MEADVILLE, PA.

No. 27 1/2
BRICK HAMMER



Drop Forged — Black Enamel Finish
Adze Eye
Hickory Handle

No.	Size
27 1/2	#2/0—10 oz.
27 1/2	#0—18 oz.
27 1/2	#1—24 oz.
28 1/2	#1—24 oz.

No. 88 LONG NECK ELECTRICIAN'S HAMMER

Designed specially for working over conduit and nailing junction boxes. Full Polished, Black Neck. Weight, 18 oz.

No. 451 1/2
"Our Pride"
NAIL HAMMER

Special Analysis Steel. Properly heat-treated to insure maximum durability for claws, face and body. Square face provides wider striking surface at edge of face and enables easier driving of nails close to abutting surface and in corners. Claws are clean-cut and sharp for easy gripping of nails of all sizes. Lacquered handle is moisture proof, full octagon, nonslipping, and easy on the hands. Weight, 16 oz.

FOR HIGHEST QUALITY TOOLS BUY CHANNELLOCK

HERE are a few of the many items in the complete Champion-DeArment Channellock line. On these pages you see the result of three quarters of a century experience in producing highest quality tools. Send for our Catalog PS-6 for complete information on the full Champion DeArment line of fine tools.

BALL PIEN HAMMERS

No. 20
Full Polished Finish
(Painted Neck)
No. 20 1/2
Black Enamel Finish
Dropped Forged
Hickory Handle
This hammer available from 2 oz. to 3 lb.

BRICK CHISELS AND SETS

Drop Forged — Black Enamel Finish

No.	Size
52 Single Bevel	3"
	3 1/2"
	4"
53 Double Bevel	3"
	3 1/2"
	4"

No. 140
WRECKING BAR

Forged from High-grade Hexagon Tool Steel . . . Heat Treated for Maximum Strength . . . Tips Hardened to Resist Wear . . . Pry End Carefully Ground . . . Claw End Separately Forged and Ground Just Like a Nail Hammer Claw . . . Clean . . . Sharp . . . "Nipper-Grip" Claw for Easy Gripping of Nails of All Sizes. Distinctively Painted Red and Black Lacquer. 18, 24 and 30 inch lengths.

No. 148
HEAVY DUTY NIPPERS

This "Heavy Duty" Nipper is specially designed for Concrete Form Builders, Carpenters, Mechanics, Farmers and for Miscellaneous work. It will easily cut large nails, small spikes, form tie wires, reinforcement wire, etc. Drop forged from special analysis steel, and designed to give greatest leverage and strength. The stops prevent dulling of cutting edges and provide adjustment when edges have worn. Polished head. Painted "T" handles. Cutting edges hand filed. Available in 8, 10 & 14 inch lengths.

CHAMPION DEARMENT TOOL CO • MEADVILLE, PA.

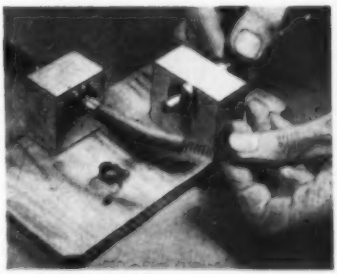
6 Ways to Make Power Turn Corners

Elbowing your motor up to the job at hand is a cinch —but it pays to choose the right type of power angler.

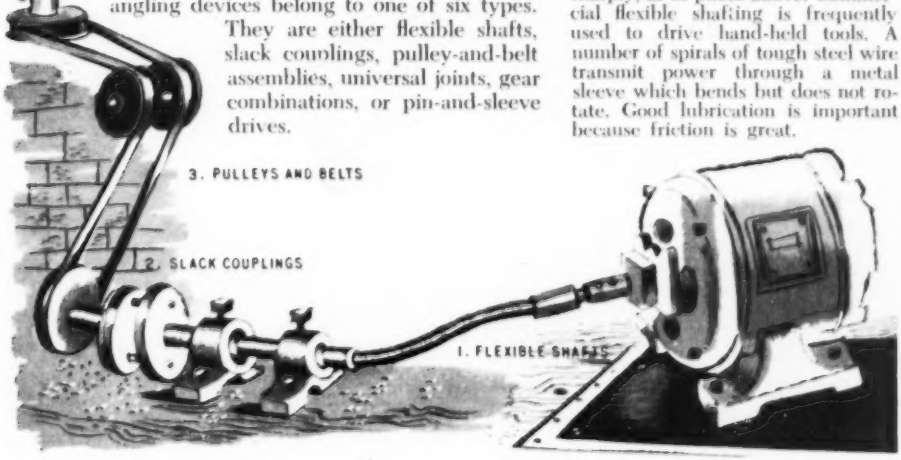
By Walter E. Burton

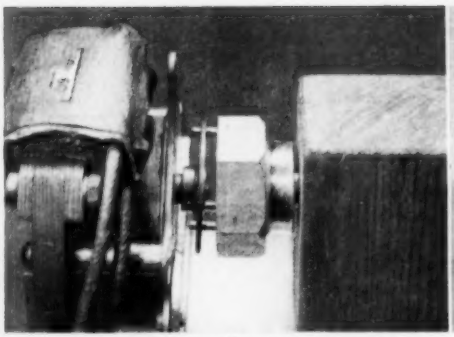
ROTARY power turned its first corner when a cave man twisted two slack vines into a rope. Although he didn't know it, he had come up with a flexible shaft. Since then, inventors have outdone the pretzel industry with torque anglers that range from the meshing hardwood gears of primitive water wheels to the smooth-working universal joints, speedometer cable, and ring gears and pinions in your car. Thrown in for variety are combinations of pins and sleeves that fall all over themselves in zany actions that delight the eye but are seldom put to practical use.

In spite of their variety, almost all power-angling devices belong to one of six types. They are either flexible shafts, slack couplings, pulley-and-belt assemblies, universal joints, gear combinations, or pin-and-sleeve drives.



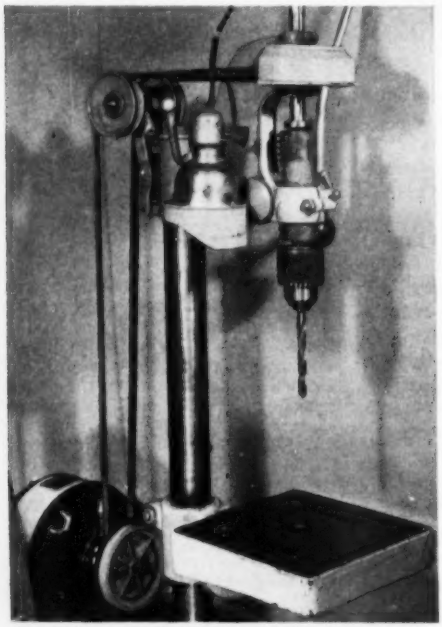
1 Flexible shafts let you angle power in any and all directions. Simplest form is a short length of hose connecting two unaligned shafts. A light coil spring slipped into the hose prevents the rubber or plastic from collapsing when the union is angled sharply, as in photo above. Commercial flexible shafting is frequently used to drive hand-held tools. A number of spirals of tough steel wire transmit power through a metal sleeve which bends but does not rotate. Good lubrication is important because friction is great.



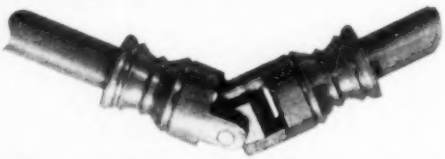


2 Slack couplings will give your motor a positive link with unaligned shafts if the angling between them is small. The coupling above shows how. Pins projecting from the face of one disk pass through holes in another. Wear is great where the power load is heavy, so the pin should be well lubricated.

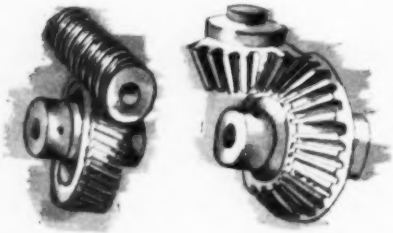
In this application—a combined slack coupling and flexible shaft used to agitate photo solutions—a low-speed motor makes the slack coupling work at its best. And the slight erratic motion, caused by some whip in a well-worn speedometer cable, keeps the chemicals well mixed.



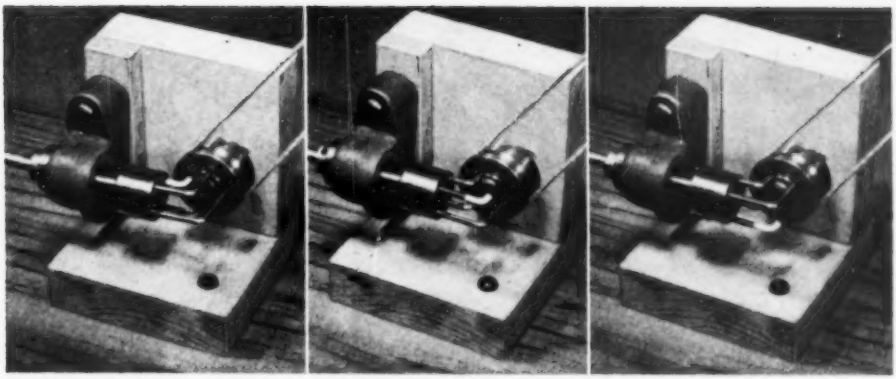
3 Pulleys and belts slapped the power of big stationary engines to hundreds of thousands of factory tools before fractional-horsepower electric motors brought a separate set of mechanical muscles to each job. Where motors are bench-mounted, as in the case of the drill press above, some shop tools still use angled belt-and-pulley drives. The number of angles you can turn with a train of belts is unlimited, although slippage may make the arrangement impractical. You can also use belts to elbow power to hand-held tools by placing pulleys at the junctions of hinged rods. Your dentist's drill is a good example of this.



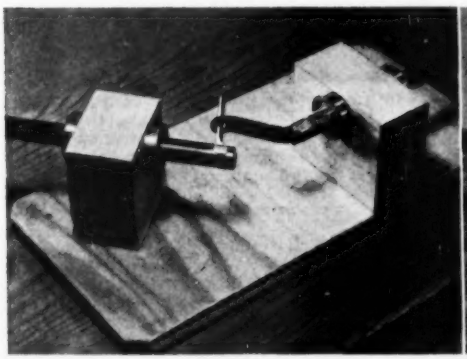
4 Universal joints are husky power benders. Formed of two U-shaped forks placed at right angles, they pivot on pins in a central block or spider. This type of positive link between a motor and driven shaft wears far better than a slack coupling and carries a fairly smooth flow of power around angles of up to 45°, in any and all planes. Needle bearings and other antifriction devices, sometimes combined with grease-retaining boots, help commercial universal joints serve you long and dependably.

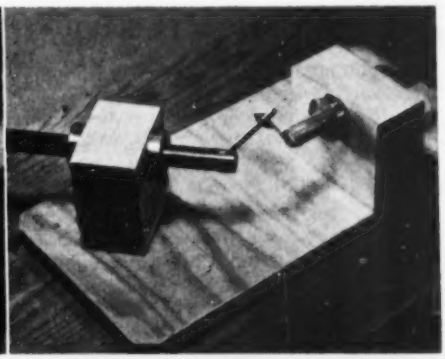


5 Gears solve power-cornering problems for everything from model locomotives to washing machines. The worm-and-gear set above, at left, converts high worm speed to very low driven-gear speed. Bevel gears above, at right, are more versatile, for they can increase, decrease or duplicate motor-shaft speed. A third form of gearing used to angle power is the helical type, in which the teeth are cut at 45° angles across the gear faces. If both helix gears have their teeth inclined in the same direction, they will mesh at right angles.

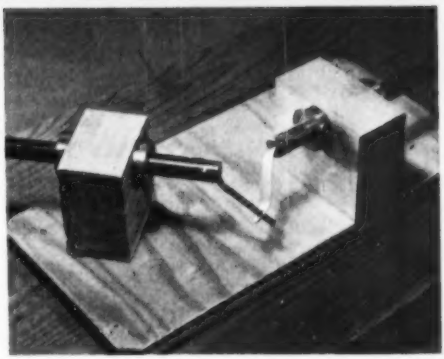


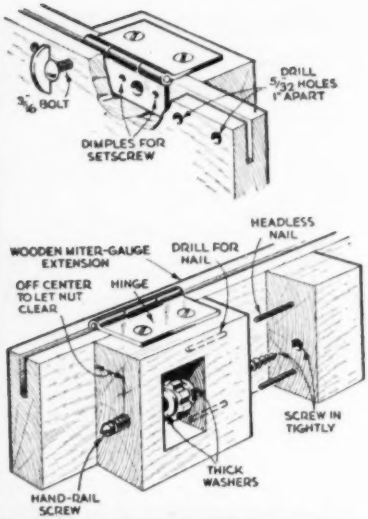
6 Pins and sleeves. These torque turners are ideal for the gizmos in a mad scientist's laboratory. But if you want to convince Junior that the most complicated machine is not necessarily the best, you can do it by building a reasonably accurate facsimile of the model above. To your own amazement it will work very smoothly, dazzling you with a display of busily shuttling arms. But don't try to make it turn the butter churn—its angled pins have an aversion to hard labor. Here's how it operates: A pillow block and bushing are lined up at right angles and a shaft is passed through each. On each shaft end is a thick cylindrical head with four holes bored through it, as shown in the photos. The holes in both heads are the same distance from the centers of the shafts and would mate if the heads were placed face to face. Pins bent to 90° angles connect corresponding holes. When one shaft is rotated, the pins transmit vertical motion to the driven head, while horizontal motion is absorbed by a backward-and-forward movement of the pins in their sleeves. Still puzzled? Then notice that one of the pins in the model has been painted white, to let you trace its shuttling action. By now, Junior is way ahead of you. He's convinced that pins and sleeves don't necessarily *have* to work at right angles. And he is absolutely right!



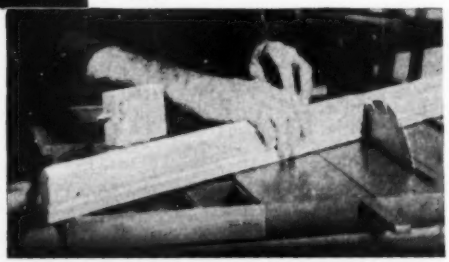


Cross a slack coupling with a pin-and-sleeve drive and you get this hybrid sidewinder. A fixed arm with a hole drilled near its outer end is mounted on one shaft, and a pin is pivoted in a slot at the end of another shaft. The fixed arm is then bent in such a way that the pin will engage the hole without binding when the shafts revolve. Photos taken at intervals show both hinging and sliding actions which keep this angled drive from buckling. The hookup works best when the shaft with the pin does the driving. Unlike the model at the top of the page the sidewinder is so simple in design that it has been widely used in toy manufacture. An outstanding example is the drive used in inexpensive toy motorboats. In some of these, two angled pins make sliding contact, eliminating the pin-and-hole connection. **END**





IT'S DOWN when you want to use the stop block for sawing to exact length. A thumb nut provides vernier adjustment, while rough setting is made by sliding the entire block assembly along the wooden miter-gauge extension and clamping it with a setscrew.



IT'S UP for making intermediate cuts on long stock, but the stop setting is retained for further use. This is handy in making miter joints, when you must often saw off a reverse angle left on the material, but will need the stop again afterward for cutting to length.

Miter-Gauge Stop Swings Up to Let You Cut Long Stock

THE usual miter-gauge stop or clamped block must be removed to saw a piece that extends past it. But here is a stop you flip up to handle such long pieces. When you drop it back, it is in precisely the same location as before.

To rig such a stop, first saw a kerf along the top edge of the wooden extension to be bolted to the miter gauge, deep enough to receive one leaf of a stout butt hinge. Drill a series of 5/32" holes behind the kerf. Turn a 3/16" bolt into them to cut its own threads. Also drill four dimples in the hinge leaf at such a height that the bolt will seat firmly in any of them.

A plain stop block can be screwed to the free leaf of the hinge. But for vernier adjustment, cut a mortise in the block and drill a ⅜" hole across it as shown. Insert the machine-screw end of a ⅜"-by-4½" handrail screw, with washers on each side of the thumb nut. Screw the pointed end fast into a second smaller block. If necessary, a pair of headless nails can be driven into one block and matching holes drilled in the other to form guides, as shown in the drawing.—*Harry Louden, Sarasota, Fla.*

Concrete Mixer Serves as Tumbling Barrel to Clean Rusty Tools

SEVERAL persons in this area used a concrete mixer as a tumbling barrel to clean up large supplies of rusty nuts, bolts, nails and small tools after a recent flood.

It was done by throwing three shovelfuls of sand into the hopper, dropping in the rusty articles and running the mixer for 10 minutes to half an hour, depending on the amount of rust.

Then the mixer contents were dumped on wire screening placed over a barrel and the articles raked back and forth until the sand had sifted through.—*James Schwinn, Manhattan, Kan.*

THEY CAN'T RUST if you keep them in DRY VAPOR PACKVELOPES® with VPI

HERE'S positive RUST PROTECTION for

circular saws • chisels • drills • auger bits • pruning shears • planes
steel rules and tapes • compasses • dividers • calipers • hunting knives
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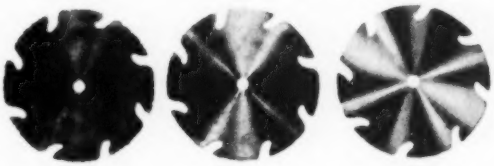
auto parts and accessories • files • taps • dies • golf clubs • any steel tools



without protection — with oil protection — with VPI protection

YOU NEED NO OIL, NO GREASE, NO FUSS OR MUSS • Just pack them and forget them.

Send for Berlin & Jones' big no-rust miracle package containing a dozen assorted VPI* envelopes, large size to protect circular saws, others for tools and small parts—plus a big 12 x 36 sheet of VPI* coated Kraft paper, enough to protect an average power tool or to line a large tool chest and drawers. You get the same rust protection used by the U. S Government and leading industries in this no-rust miracle package for only $2. Included free is a handy booklet of practical proven VPI* uses. Money back if not satisfied.

*Vapor Phase Inhibitor

No oil, no grease, no goo, no dirty degreasing job, no clean-up necessary—thanks to this miracle paper which turns destructive moisture into protective VPI vapor . . . giving you years of positive protection from rust.

HUNTERS • PROTECT YOUR GUN FROM RUST
Just slip it into a specially made PACKVELOPE **GUNBOOT** with VPI. Will keep it rustproof for years. No oil, no grease, no cleaning. Only **$2.** Satisfaction guaranteed or money refunded.

If not at your local hardware or sporting goods store WRITE us and we'll see that he gets them or

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Cut costs way down on handling and packing of ferrous materials. Get same rust protection as used by U. S. Government. Write for Technical bulletin on VPI to: Engineering Department, Berlin & Jones, 601 W. 26th St., N. Y. 1, Dept. P.

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Every hardware store can sell VPI packages on sight to their trade with our self-service, self-selling kit. Makes money for you without effort. Ask your jobber or write for complete details to Berlin & Jones, 601 W. 26th St., New York 1, N. Y., Dept. P, Wholesale Division.

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601 West 26th Street, New York 1, N. Y.

Send me_____(through my dealer) no-rust miracle package(s) of VPI envelopes and paper at $2 per pkg.

Send me_____VPI Gunboots @ $2 each.

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Enclosed check ☐ money order ☐

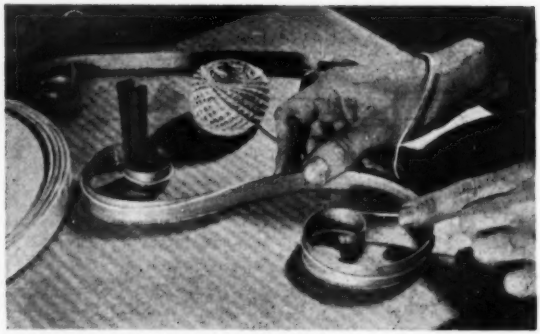
PAINTED BLACK, molded-plastic scrollwork takes on appearance of wrought iron. For wrought-aluminum effect, use aluminum paint; for weathered bronze, a gray-green flecked with copper gilt.

Plastic Ornaments Look Like Metal

"Wrought-iron" scrollwork, just like real, takes only minutes.

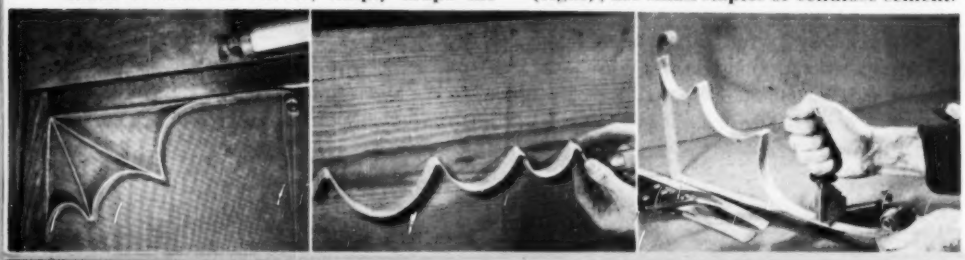
YOU don't have to be a blacksmith to turn out attractive ornaments that have the look of real wrought iron, bronze, aluminum or copper. By using narrow strips of a plastic-impregnated fabric, you can—where strength isn't needed—bend up fancy curlicues and other decorative designs at a fraction of the time, cost and labor of real metalwork.

The material is first softened by dipping the strips for a few seconds in a shallow tray of special solvent. Then the strips are wrapped around metal forms that you can either make yourself or buy from the manufacturer. Among the dealers that sell the plastic (Celastic) and solvent is Ben Walters, Inc., 156 Seventh Ave., NYC.—*Walter E. Burton, Akron, Ohio.*



TO FIND LENGTH OF STRIP NEEDED, wind string around metal form, held by spring-type clothespin at one end, and transfer measurement to plastic. Then wrap plastic around form, remove form, set strip aside to dry.

CORNER BRACKETS add inexpensive decorative touch to a screen door (left, below). To make a series of curves, simply drape the softened strips over row of nails (center) and let dry. To fasten the strips to each other (right), use small staples or cellulose cement.



Look what you can do with this New Black & Decker Saw!

Fully adjustable for every depth and angle cut from 2" at 90° to 1⅝" at 45°.

Powerful B&D-built motors take the tough spots without overheating or slowing.

New lever arm permits safe retraction of lower guard to make pocket cuts.

B&D saw-grip handle is always at natural sawing angle. Rugged, king-size shoe gives better balance.

Try it yourself and get a chance to win $1,000.00

Get a demonstration of this wonderful new saw at your Utility dealer. Then fill out a free entry blank, describing the features you like best—and you may win $1000 in Black & Decker's big Saw Contest!

Bob Davis says:

Send 25c for my "Handy Tips" booklet, full of home repair ideas plus information on patterns for projects like sample below.* (No stamps, please).

*T. M. Reg. East Bild Pattern Company

For address of your nearest dealer see "TOOLS - ELECTRIC" in the Yellow Pages of your telephone book.

Need more living space? Do-it-yourself materials let you convert your attic or basement at far less cost than you ever dreamed! And the new Black & Decker Heavy-Duty 6" Adjustable Saw takes the back-breaking work out of the job!

This new saw makes angle cuts, bevel cuts—every cut you need to add a beautiful room to your home, or make bookcases, cabinets, etc. You can get information on plans and patterns by mailing the coupon below, and your dealer will advise you on materials. When you visit him, ask to try the new Adjustable 6" Saw—as well as the larger 7-, 8- and 9-inch Heavy-Duty Utility Saws!

Black & Decker

UTILITY ® PORTABLE ELECTRIC TOOLS

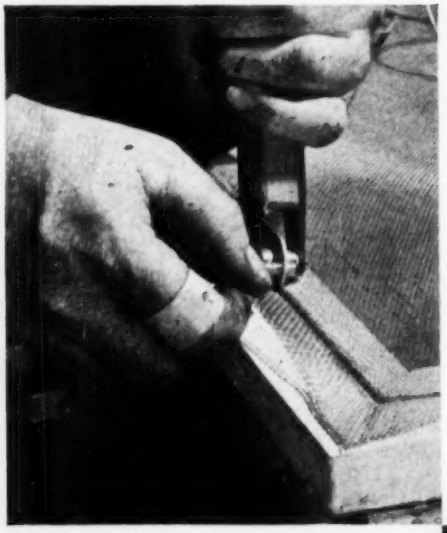
Bob Davis, Home Service Dept. H65, The Black & Decker Mfg. Co., Towson 4, Md.
Please send me "Handy Tips for Handy Men." I am enclosing 25c.

Name _____

Address _____

City _____ Zone _____ State _____

Rolling Your Own Screens



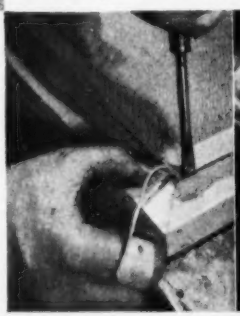
CUT THE SCREENING to outside frame dimensions. Aluminum or copper mesh works best; galvanized screening is brittle and more prone to tear. Starting at one corner, roll the material part way into the groove. Then lay strong twine over it and roll hard, forcing both twine and screening deep into the groove.

This tackless groove-and-roller method does a quick smooth job.

HERE is a speedy way to make good window screens. The mesh is smoothly and tightly stretched, and there are no tacks to put in one at a time or rust out later.

Miter the frames, using the same width of stock all around. Then run a ⅜"-deep saw kerf in one face along the inside edges of all four pieces. Assemble with glue and nails or corrugated fasteners so that the groove is continuous all around.

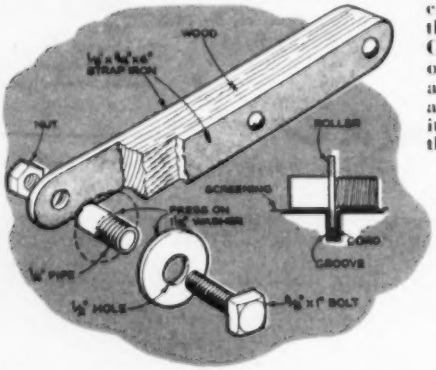
Make the roller by turning or grinding a deep flange on a short piece of round stock, or by mounting a big washer as in the drawing. Thickness is critical; the roller should be a loose fit in the kerf to leave room for the screening to be forced in on both sides. Round off the roller edges; they should not be sharp.—*J. M. Finn, Pittstown, N. J.*



ROLL OPPOSITE SIDE next to pull screening evenly across the frame. Twine keeps the mesh from being cut by the roller. Do the other two sides. Cut screening from outer corners to groove at 45° as above. Use a screwdriver to push it and the twine in at the extreme corners.

COVER THE GROOVES and screening with half-round or flat molding, mitering the corners the same way you did the frames. Nail with brads. Then run a sharp knife along the outside of it to cut off excess screening. Paint the frames and add hangers.

TRY SEVERAL WASHERS in the kerf made by your circular saw to find one that is a loose fit (if yours is a very narrow blade, it may be well to change or reset it). Cut a ¾" length off a ¼" pipe nipple and file down the threads until you can drive on the washer tightly. Be careful to keep it square. File the shank of a bolt until the pipe turns on it freely. Mount in a strap-iron-and-wood handle as shown.



Typing Ribbon Changed Quickly

CHANGING a typewriter ribbon is quicker and cleaner if you fasten the end of the old ribbon to the new one with cellulose tape. Pulling the old ribbon through the guide will thread the new one in behind it.—*Henry Josephs, Gardenville, Pa.*

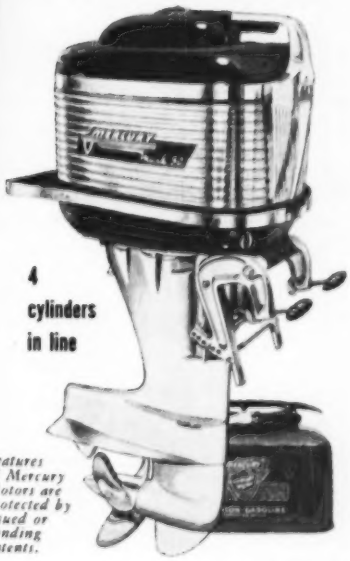
fun? you know it!

When the POWER'S by KIEKHAEFER MERCURY

the outboard that made water skiing everybody's sport!

40 h.p. MARK 50

Today's Most Powerful Outboard! Forward, Neutral and Reverse!



4 cylinders in line

- Power—and plenty of it for skiing, for big outboard cruisers!
- Easiest starting of any large outboard because of exclusive 4 cylinder in line construction.
- Integrated remote control design arranged for inside or outside steering.
- Sealed under-cowl—protection against spray, following seas.
- New Cowl-Around carrying handle.
- Compact, modern styling.
- Remote fuel tank.
- Famous Thunderbolt engine for super-smooth power flow . . . overlapping torque.
- New "Hi-Thrust" lower unit, geared for power efficiency with heavy loads.
- "Full Jeweled Power" — Ball and roller bearings throughout.
- Optional: Exclusive 12 volt electrical system — starter and generator to power lights and accessories.

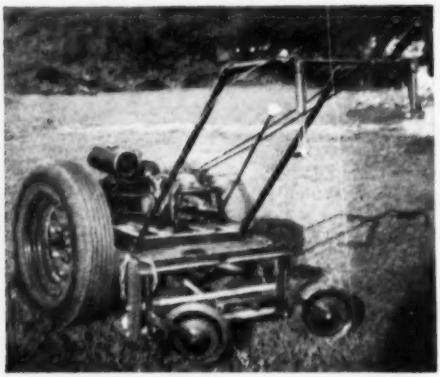
Features of Mercury Motors are protected by issued or pending patents.

See your dealer for a demonstration, and Mercury will be your choice, too! Take your pick of two great Mercury models for water skiing . . . and ask for FREE Mercury booklet, "How to Water Ski With An Outboard"!

© 1954 KIEKHAEFER CORP., Fond du Lac, Wis.

CRAFTSMEN AT WORK

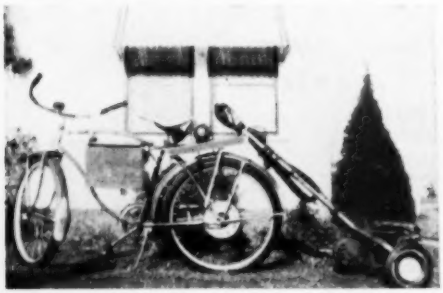
Tractor, built by Thomas Giese and his dad of Montello, Wis., can tow a car with ease. Power from a 1½-hp. Briggs & Stratton engine goes through a three-speed transmission salvaged from an Overland, into a Model T rear end. Total cost of parts was $47.50. Nice touch is exhaust sticking up through sheet-metal hood just like on big jobs.



Plow Puller. Capable of turning up a 6″ furrow in second gear, this machine has a 1½-hp. Continental engine with a built-in 6-to-1 reduction gear. Power is carried by a chain on 1-to-1 sprockets to a 1931 Chevrolet transmission at the rear. On the output side, twin 3″ pulleys and V belts drive 9″ pulleys on separate countershafts.

Each belt has its own idler, so that the wheels can be controlled separately. A chain from a 7-tooth sprocket on each countershaft drives a 28-tooth sprocket on each wheel. Top speed is 4½ m.p.h. The machine was built by Walter Heath of Neptune, N. J.

Electricity Pedals this bike at a good clip. L. W. Rives of Woodward, Okla., installed the power unit so his son Bob could haul an electric lawn mower between jobs. The frame was altered to make room for an auto battery, and a salvaged car starter was mounted over the rear fender. Power is carried by a belt to pulley on rear wheel. Bike goes four to six miles on a charge.



Motor Scooter Built for Two. This tandem scooter, powered by a 6-hp. Wisconsin engine, has only one speed forward, yet it climbs hills with two adults and tops 30 m.p.h. on level ground. A Mercury centrifugal clutch gives smooth starts without shifting. Two controls, throttle and front-wheel brake, are on the handle bars. August Dobert of Nashville, Tenn., built it.

Bright Ideas For VACATION PROJECTS

"Liquid Aluminum"

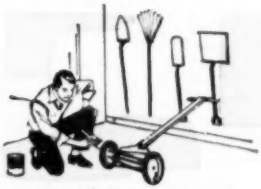
Spray or Brush it on Like Ordinary Paint . . . Give Bright Protection to Your Home, Equipment, Do-It-Yourself Jobs!

Weather protection for rustable gutters, downspouts, flashing, with a bright coating of moisture-resistant *Liquid Aluminum!*

"Light up" your driveway edging by night and beautify it by day with this sparkling wonder-coating of *Liquid Aluminum.*

Vacation's the time to get going on those outdoor improvement and maintenance projects. Imagine a coating that gives you the bright beauty and supreme protectiveness of *real aluminum* . . . yet goes on just like ordinary paint. Check over all your outdoor items that need *Liquid Aluminum* to resist rust and hide discoloration. Made by leading paint manufacturers. Keep a can on hand always.

Backyard gym for the youngsters is protected against rust and weathering for years longer with the bright beauty of a *real aluminum* coating.



Garden implements look like new again when painted with *Liquid Aluminum.* Brighten up rakes, lawnmowers, outdoor furniture, too.

Amazing Leafing Action

Protective beauty that *lasts years longer* is due to this unique "Leafing" action. Tiny flakes of aluminum rise to the surface as *Liquid Aluminum* dries to form a firm, tight coating of real aluminum.

For "All-Purpose" Type, look for shining foil label at left.

FOR ROOFS, *use heat-reflecting Liquid Aluminum with asphalt. Look for the special Warranty Seal that guarantees the right amount of aluminum in an approved vehicle.*

This advertisement appears in the interest of the Paint Industry of America

REYNOLDS METALS COMPANY • 2500 SOUTH THIRD STREET • LOUISVILLE 1, KENTUCKY

Gus Lends Luck a Hand

[Continued from page 162]

oil back in. He started the motor, eyes on the pressure gauge. It climbed to 20 pounds on the cooled oil.

"Well," the old man inquired anxiously. "Did that fix it?"

"We'll let her warm up," Gus told him. "We can't tell when it's cool."

Oil Pressure Still Falls

Gus could feel the woman's eyes on his face as he sat there, running the motor, watching the oil-gauge needle go down. Slowly it fell, until on the idle it again laid almost against the pin. Gus hated to look in the direction of the woman.

"No," he said honestly. "That didn't fix it."

He was twice a fool, he told himself. He should have looked over the oil-pressure check valve first. It might be gummed up or have something holding it open. He knew one once that had a chip of wood under it. Sweat beaded Gus's weathered features as he raised the hood and removed the spring and ball check from the side of the block, washed them in gas, and blew out the seat with the air hose. He replaced the check valve and again started the motor. The oil pressure remained the same. Hodge looked at the gauge and his face seemed to sag, to grow more wrinkled and tired.

"Well," he said, "thanks for trying, mister. We'll be on our way."

Gus backed to the bench, leaning on it, wiping his hands, fumbling his pipe out of his pocket.

"I'm not through yet," he remarked quietly.

Gus Goes in for More Tools

Stan Hicks jumped into the heavy silence, moving briskly forward to begin sweeping dust from the front floor mat with a whisk broom. The woman coughed thinly.

"Sure is dusty these days, isn't it?" Stan remarked brightly.

Gus straightened from the bench and moved into the stock room. He came out with four long, thin pipes in his hands, selected tools from his kit, ducked under the hood, his burly shoulders blocking all view of what he was doing. A few minutes later he straightened up and wiped his hands on a piece of waste. Then he reached in to turn the ignition switch and depress the starter. He remained there a few moments, revving up the motor and letting it idle. Then he turned and his smile crinkled the crow's-feet at his eyes.

"I reckon, Mr. Hodge," he said, "that you can be on your way now—west."

The old man stepped forward quickly, his eyes holding disbelief, seeing the oil-pressure-gauge indicator standing at 20 pounds at the idle.

"I declare," he said. "You've gone and fixed it."

"Some mechanics," Gus told him, "forget that main and rod bearings aren't the only bearings in the oil-pressure line. This car has gone over 80,000 miles. You're losing your oil pressure through badly worn camshaft bearings. This car will take you now."

Gus Sets a Price

Hodge fumbled in his pocket and drew out a worn purse.

"How much do I owe you?"

"The oil pump," Gus told him, "isn't any better than the one you had when you drove in—you're welcome to the one I put in. I'll charge you four dollars for four camshaft oil regulators. I don't use them often, but I do keep them on hand for emergencies like this, when the oil flow to the camshaft has to be metered down to hold up pressure. When you get to Colorado and get the money, you'd better have new camshaft bearings installed."

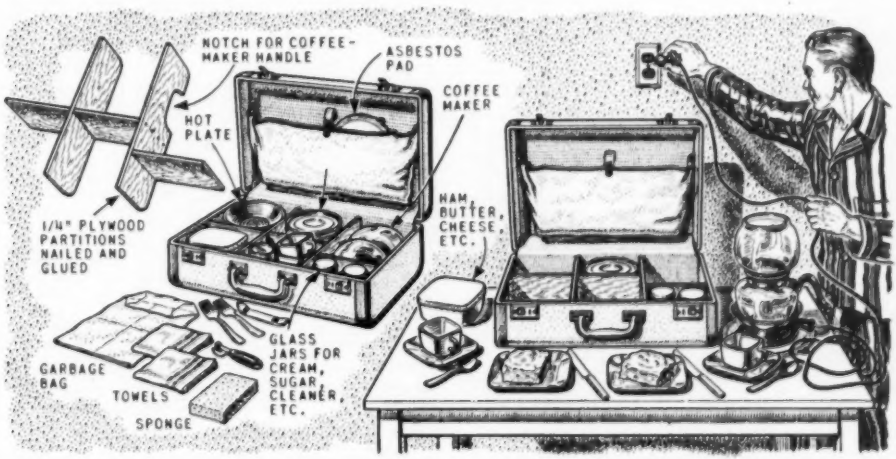
"I told you, Sam," the woman said, and her thin face lit up with renewed faith. END

NEXT MONTH: Gus meets an invasion.

Hints FROM THE MODEL GARAGE

Bugs on your windshield can be washed off easily with an 8" square of tent-weight canvas soaked in water. The canvas is rougher than a cloth and does not slide over the dried-hard spots. When clean, dry the windshield with a paper towel or a cloth.

If your car has no turn signals, you can make your hand signals more visible at night by attaching strips of reflecting tape to a special driving glove that you keep in the glove compartment. Strips can be put on both sides of the glove.

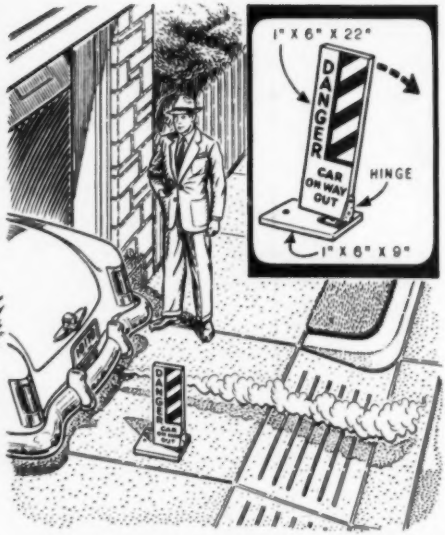


Whip up a meal anywhere with this fitted food kit. Many overnight road stops are nowhere near a diner, but there's a good chance you'll find electricity and water. Everything else you'll need is in the kit. Divide a 12"-by-18" suitcase, about 6" deep, into compartments with plywood partitions to hold a coffee maker, hot plate, can of coffee, square plastic cups, bowls and dishes, jars of sugar, powdered cream, and detergent for cleaning up. Ham, eggs, butter and other perishables should be replenished daily.

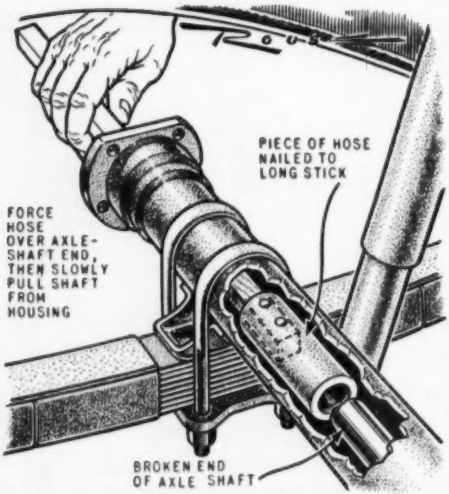
Please turn the page for more auto hints.

MORE Hints from the Model Garage

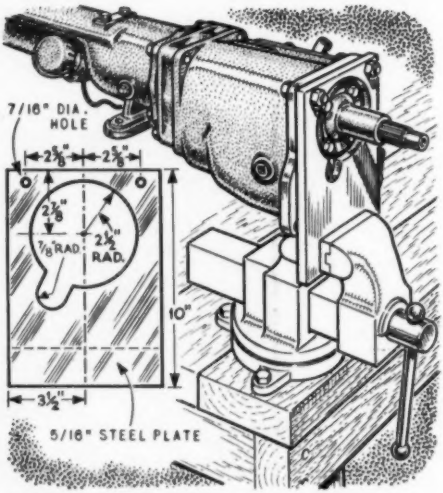
In dusty driving, it helps to close all windows and open the cowl or heater vents wide. This raises the air pressure inside the car. If the windows are partly open, pressure is reduced and dust is sucked through the seams and body openings.



A danger signal like this will warn pedestrians if you must back out of your garage across a sidewalk. Set it upright on the walk, then back over it, knocking it down on its hinged base. Hang the sign on a nail inside the garage when you close the doors.



Tack a short piece of radiator hose to a stick to fish out the remaining stub of a broken axle shaft. Try different sizes of hose on the broken end of the piece that came out of the housing to find a diameter that will fit snug enough to do the job.



Support a '49-'54 Ford transmission for easy overhaul by bolting it to a heavy steel plate clamped in a bench vise. The large opening gives access to the bolts holding the main-shaft bearing retainer and the small opening permits removal of the countershaft.

SWP HOUSE PAINT

Lasts Longer... Saves Money

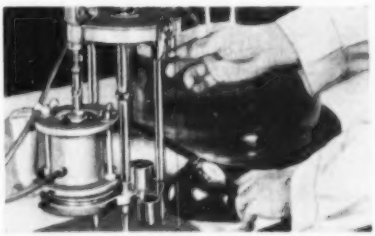
It pays to be "choosy" when you select the *brand* of house paint to be used on your home. Whether you employ a painting contractor or not, the price difference between world-famous SWP® House Paint and house paint of ordinary quality will mean less than $5.00 for the average-size, complete house job. This slight difference in cost pays for years of extra wear and is one of the wisest economies you can make.

In 1953, Sherwin-Williams SWP House Paint was used to paint more homes in America than any other brand. Why? Continuous research in Sherwin-Williams Testing Laboratories and in the field has insured constant improvement and the top-quality performance of SWP. You'll be money ahead when you discover there *is* a difference in house paints!

FREE: For full information on SWP House Paint and lots of interior decoration ideas, too, ask your dealer for a copy of the 44-page "*Home Decorator*" or write to The Sherwin-Williams Co., 1261 Midland Building, Cleveland 1, Ohio.

Tested for Your Protection . . . A most exacting procedure of quality-control testing through every step of manufacture, from raw materials to finished product, assures maximum beauty and protection in SWP House Paint. Laboratories in every Sherwin-Williams factory are charged with the responsibility of absolute quality control of every gallon produced.

White and Colors That Last . . . All over the country, in all climates, Sherwin-Williams maintains test stations where house paints of every type and description are exposed to years of weather and wear. SWP white that stays *white* and SWP colors that maintain their brilliance are the direct result of this painstaking research.



Ease of Application Assured . . . Invented by Sherwin-Williams Testing Laboratories, this instrument, known as the high shear viscometer, is an extraordinary development which makes possible the scientific measurement of the brushing qualities of paint. This testing procedure has made possible the superior brushing qualities in SWP House Paint which insure remarkable ease of application.

Let us recommend a reliable painting contractor.

Go to the store that displays this famous trade-mark . . .

SHERWIN-WILLIAMS SWP **HOUSE PAINT**

ON TV . . . TUNE IN THE SUPER® KEM-TONE SHOW, STARRING RAY BOLGER . . . ABC NETWORK EVERY WEEK

Use good files on your

YOU really get the urge to make and repair things when the files you use are Nicholson or Black Diamond. There's a rare crispness in their bite, economy in their long-lasting sharpness, satisfaction in knowing that you have the world's finest.

The man in the picture is finishing off a pair of hardwood book ends, but even his modest assortment of these *good* files can take care of scores of jobs around the house, garage and workshop.

It's worth while going out of your way to get Nicholson or Black Diamond files, but most good hardware and tool-supply houses have them . . . because they know that "once a customer, you're *always* a customer."

FREE BOOK, "File Filosophy," will help you on your Do-It-Yourself projects. It has 48 illustrated pages on kinds, use and care of files. *Send for it.*

NICHOLSON U.S.A.

NICHOLSON FILE CO.
19 Acorn Street
Providence 1, R. I.
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILES *FOR EVERY PURPOSE*

Look What's Happened to Trailers

[*Continued from page 120*]

fire departments, swimming pools, theaters, grocery stores, garages, restaurants and service by the school-district bus.

A total of 12,000 trailer parks, representing an investment of $250,000,000, serves the U.S., but probably only a third are of the larger type described above.

As for buying a trailer in the first place, it is a fairly painless transaction these days. Most purchase contracts call for one-third down, with a generous maximum of five years in which to pay off the rest.

Most states already charge personal-property taxes on trailers, and some areas are pressing for passage of trailer real-estate taxes, considering them, in actuality, houses. They have not been taxed as automobiles anywhere since 1951.

Trailer Driving Takes Practice

If you are among the 50 percent of all trailer owners who do not resort to being hauled by truck, you will find that towing a trailer is not difficult.

Backing comes with practice and ought to be done solo (to avoid taunts and jeers) in a large, open space. It is also helpful to spend a while down at the loading platform of your local supermarket, watching a "semi" driver do his stuff.

Braking is a distinctly delicate operation. Rule One is to apply the trailer's brakes (electric, air or hydraulic) gradually, before you apply those on your own car. Your car engine is a good brake and should be used often.

Cornering is one of the biggest problems. But all you have to remember to do is what would probably earn you a traffic fine if you were driving your car alone. That is, keep about seven feet from the curb and head for the middle of the intersection when you are about to turn right or left. Otherwise you may add those folks waiting on the corner to your passenger list. END

NEXT MONTH in* Popular Science*: The surprising luxuries you find nowadays when you stop overnight at a motel.

Get PISTON RINGS that are made right for your FORD

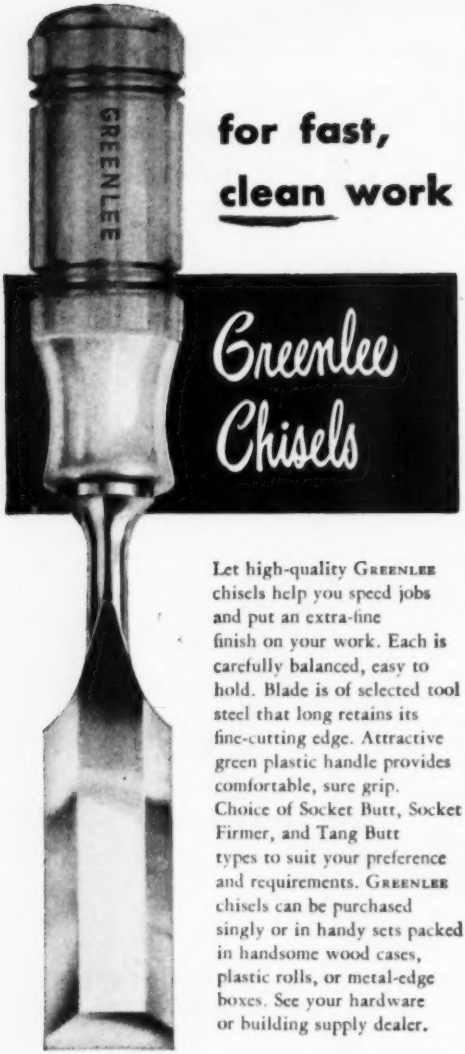
Ford piston rings reduce break-in wear on cylinders. Top ring's chrome plating and second ring's phosphate coating make the difference. Bottom ring's expander adjusts to worn spots for pressure just right for Ford engines.

All Genuine Ford Parts—like the piston rings shown above—are made right . . . to fit the specifications set by the men who originally built your Ford!

With all the driving that lies ahead this summer, it's good to know your Ford will get full mileage out of the gas and oil you buy. That's why you should have your rings checked *now*. If new rings are needed, be sure you insist on Genuine Ford Piston Rings. They mean longer piston life, better oil control, more power and economy. Like all Genuine Ford Parts, they're *made right* to work right to last longer in your Ford!

GENUINE Ford PARTS

WHEREVER YOU GO, INSIST ON



Let high-quality GREENLEE chisels help you speed jobs and put an extra-fine finish on your work. Each is carefully balanced, easy to hold. Blade is of selected tool steel that long retains its fine-cutting edge. Attractive green plastic handle provides comfortable, sure grip. Choice of Socket Butt, Socket Firmer, and Tang Butt types to suit your preference and requirements. GREENLEE chisels can be purchased singly or in handy sets packed in handsome wood cases, plastic rolls, or metal-edge boxes. See your hardware or building supply dealer.

TOOLS FOR CRAFTSMEN
GREENLEE

SPECIAL OFFER...GREENLEE Woodworking Calculator only 25c. Converts linear to board feet, gives nail specifications, tool sharpening tips. Compares woods, gives bit sizes for screws, concrete mixes, painting information, etc. Convenient ... simple to read. 6" diameter circular shape ... heavily varnished cardboard. Send 25c (no stamps please).

GREENLEE TOOL CO.
2126 Columbia Ave., Rockford, Illinois

The Car That Has Changed the Most

[Continued from page 142]

enjoyed a flashy transitory existence in harness with a gasoline engine. This teamwork went on beneath the handsome and ponderous body of the Owen Magnetic, which weighed at least 600 pounds more than a gasoline-powered car of comparable size and cost as much as $5,700.

In the Owen Magnetic, a gasoline engine was coupled to an electric generator to produce a magnetic field, which acted on an iron shaft connected to the driving axle of the car. By varying the intensity of the field, the car could be made to go faster or slower without a clutch.

The car at first was made by R. M. Owen of New York City, under license from Baker. In 1915, Baker's company bought out Owen's and made the Magnetic until the war abruptly shut off the supply of Continental and Buda gasoline engines that Baker had been buying.

Last of the Electrics

But while the Owen Magnetic—"Car of a Thousand Speeds"—lasted, John McCormack, Enrico Caruso and others, including the fledgling U.S. "Air Service," which felt able to afford a few for staff cars, loved it dearly.

The full-fledged electric car of prewar days never revived. Probably it never will, though a vigorous and revolutionary model, using a unique kind of torque multiplication, has been created recently by young Gerald Banning of Zilwaukee, Mich. (PSM, April '54, p. 144).

The chances are strong, however, that the energetic spirit of the original Baker Electric will long preserve the form of its fourth incarnation—the busy, popular industrial truck. Perhaps, though, to keep up with the times, it will soon have to start getting its current from a new source—atomic energy. END

This Is For Certain

To keep cake from getting stale, try putting it in a paper box in the children's room.—*Hudson Newsletter.*

"SURE DOES BRING OUT THE GO FACTOR!"

SAYS

Wilbur Shaw

President, General Manager
Indianapolis Motor Speedway—
3-time winner 500 Mile Race Classic.

WALKER "PRECISION TUNING" GIVES YOU QUICKER TAKE-OFF, FASTER GET-AHEAD AND MORE PASSING POWER!

"Your muffler makes a big difference in how your car operates . . . just any old muffler won't do. To get full power from your engine that responds the instant you press the accelerator, you must have a muffler that brings out the Go-Factor.

"From the driver's seat of a new high horsepowered passenger car, I put Walker Silencers through their paces from a standing traffic start to top speed. Duplicating every driving condition that could affect muffler performance . . . uphill, downhill, fast, slow, under full load . . . or just cruising along—I kept my eyes on the tell-tale dynamometer dials. They told me the story . . . accurately as only a scientific instrument can.

"There is no doubt about it . . . Walker Silencers *do* bring out the Go-Factor of these new automobiles . . . their ability to get into quick motion—at the traffic light or on the open road."

WALKER MANUFACTURING COMPANY OF WISCONSIN • RACINE, WIS.
Exhaust Silencers • Oil Filters • Jacks

"CUT-AWAY WALKER 'PRECISION TUNED' SILENCERS for three new high-horsepower engines show the great difference in design and construction necessary to meet the particular exhaust problems of each engine. Every engine is an individual—what's good for one may be bad for another."

"ACCURATE BACK PRESSURE READINGS are shown on this instrument panel, and I saw with my own eyes the difference a Walker Silencer can make. The first rule of engineering here is—*a Walker Silencer must quiet an engine properly without increasing its back pressure.*"

Now . . . more than ever

WALKER *Precision Tuned* SILENCERS

Make the Difference!

FREE!
Send for full
Wilbur Shaw report.

Quit driving an oil-burner—get new piston rings!

Oil pumping is just the start of expense and trouble—the first danger signal from worn-out piston rings. The longer you let those old rings stay in, the more oil you'll use, the more power you'll lose, and the bigger your repair bill will be!

As your engine gets older, it runs hotter because of accumulations in the cooling system. The cylinders wear tapered and out-of-round—need more oil on the walls.

It requires a special type of piston rings—replacement rings—to deliver this extra oil, under full control, without waste.

Hastings makes replacement rings exclusively, devotes all its research on the highways and in the laboratory, to the particular replacement problems of each make and type of engine.

That's why Hastings Rings *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—in re-ring, re-bore and re-sleeve installations.

So go to your motor specialist at the first sign of oil-pumping or performance drop-off. If rings are the trouble, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car! Hastings Manufacturing Company, Hastings, Michigan; Hastings Ltd., Toronto; Piston Rings, Spark Plugs, Oil Filters, Casite, Drout.

HASTINGS

STEEL-VENT PISTON RINGS

Regular or Chrome

Tough on Oil-Pumping
Gentle on Cylinder walls

How to Buy Binoculars

[*Continued from page 206*]

workmanship here—and, in all probability, elsewhere.

Beware of "square" exit pupils. A square of light may appear in the eyepiece if incorrect design reduces the amount of light getting through. The square edges are the sides of the prisms. This has no worse result than to dim the image a little. But it does reveal faulty design *inside* the glasses, where you could not otherwise examine them.

Are lenses coated, throughout? Coated lenses are one of the great optical advances of recent years. By reducing reflection, a transparent lens coating improves the image's brightness by cutting light loss and eliminates haze detracting from sharpness. Incidentally it gives the glass a straw-to-purple tint. All the glass-to-air surfaces should be coated. But, in poor imitation of better binoculars, cheaper ones may have lenses coated on the outside only.

You will not be fooled, if you hold the glasses so that you see an overhead lamp reflected in the objective lens. There will be a number of reflections, the largest being from the outer surface. If all are dull and tinted, all the lens surfaces are coated. If all but the largest reflection are bright and have the lamp's color, only the outer surface has been coated—the maker has skimped.

No tests such as these can promise to distinguish infallibly between a good buy and a poor one. But you'll be a lot wiser for making them, and they should be made. They'll go a long way toward telling you whether a pair of glasses is good enough to serve your purpose—and what the difference is, between low, medium and high quality in binoculars. END

Wishful Thinking

When a retired locomotive engineer and his wife went on a vacation, she was determined to get his mind off railroading. She decided she had succeeded one day during the trip when they stood looking down into the vast depths of the Grand Canyon. The old hoghead's eyes were bulging like a tromped-on bullfrog's.

"Isn't it the most wonderful thing!" his wife exclaimed.

The old man finally spoke. "Man, oh man," was his awed reply, "wouldn't I like to moan my steam whistle in a hollow like that."—*C & O Tracks.*

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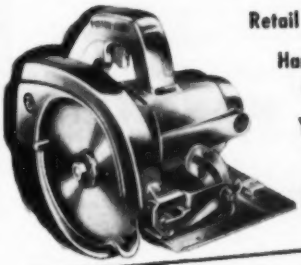
Electric Saw



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6-Inch Combination Blade—cuts 2" dressed studding, joists, and other lumber.

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Precision Ball Bearings — provide longer wear without repair.

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Simple Adjustments—for depth and angle of cut, set with two fingers.

Fully Guaranteed—against defects in materials or workmanship. Your money back if not completely satisfied!

Here's Your Big Chance!

Say goodby to tiresome handsawing! Take advantage of this exceptional limited-time offer . . . see your Porter-Cable dealer soon. Or write for list of dealers nearest you.

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and picnic table ... easy to make with MASONITE PRESDWOOD

Have fun all summer —save money! Plan AE-279 shows how to make comfortable lawn chair, "no-tip" table and benches. Table comes apart for storage. Weather-resistant panels of Masonite Presdwood® work, finish like wood. Last a lifetime. See your building materials dealer for the 33 types and thicknesses of Presdwood.

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Makers Of Evans "Long Tapes"—25-50-75-100 Ft.

Want to Climb a Mountain?

[Continued from page 93]

spot they could reach before sundown. On this ledge, smaller than many pantry shelves, they spent the frosty night. They ate chocolate bars, raisins and canned salmon to keep up body heat. The two men had tied themselves to the rock for safety, but their boots dangled out over eternity.

Regardless of how difficult the climb, supply is rarely a critical problem in the Canadian Rockies. Assaults against some of the most perilous mountains in the world still permit an alpinist to be back at a fashionable inn for a full-course dinner in the evening—if he survives. In fact, the sheerest peaks rise out of the gentlest valleys, and these valleys have been a route of empire for Canada's transcontinental railroad systems.

Mountaineering and Golf Side by Side

Mt. Colin, a modest 8,515 feet in height, looms barely more than a long tee shot from the picturesque 18-hole Totem Pole golf course at Jasper Park. The mountain rises directly above the CNR main line and the automobile road leading to Edmonton. From the stony flanks of Mt. Colin, a climber with 20/20 vision might make out the digits on a diesel-electric's number plates.

Yet this peak so close to civilization is one of the most stubborn ascents on the continent. Its cliffs are vertical and practically smooth. The distances between ledges call for risky leaps. Ridges are so sharp that even skilled climbers are reduced to the indignity of straddling them on the seats of their trousers. Visitors from Switzerland have compared Mt. Colin to the needlelike *aiguilles* in the Alps, those granite steeples that only the steadiest Swiss guide can climb.

The most tempting ascent to Americans visiting the Canadian Rockies is likewise half-circled by a railroad track. Mt. Eisenhower, named in 1946 in honor of the wartime leader of the victorious Allied military forces, lies a trifling lunch-basket hike away from the winding

[Continued on page 258]

If you have a saw

Do as carpenters do—fill all cracks and saw marks with smooth-finish Plastic Wood. Plastic Wood handles like putty and hardens into real wood.

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ATTACHES TO ANY ¼" ELECTRIC DRILL

A hack saw, jig saw and coping saw in one easy-to-use attachment! Fit into drill chuck and you're ready to saw. Fast and accurate. Cuts metal, wood, plastic, hardboard or wall board. Full 9/16" chip clearance. No gears, no bearings to wear out. Weighs just 11 oz.—handle folds for compact storage and blade protection. Ideal for sawing in those hard-to-reach plac s. With metal and wood blades (1 ea.), only **$4.95** postpaid. COD orders slightly extra. Sold with iron-clad MONEY-BACK GUARANTEE!

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Shavings from the WIZARD'S WORKSHOP

by the Weldwood Wizards with Wood

WHAT'S YOUR "SHAVING?" *Want your short cut or shop trick printed? Send it to United States Plywood Corp., Box 110, N.Y. 36, N.Y. If used, we'll send you a one year subscription to this magazine. All entries become our property. None can be returned. Keep 'em short—35 words or less.*

CAN'T GET AROUND? A handy large-radius compass is made with a strip of wire screen cloth. Use a glass headed push pin for the center; a pencil or awl for marking or scribing the circle.

A NATURAL FOR WOOD! Here's an easy way to get that costly hand rubbed look when you want a natural finish on wood. For a wizard job use Satinlac! Works fine on any wood—hard, soft, solid or ply. Protects and preserves the surface. Never looks "built-up"; never turns yellow or darkens with age.

PIN UP: Instead of plugging screw holes, try using brass countersink screws. Make countersink shallow, so that screw slot is above wood surface. Screw work tightly (best to glue it, too) then file off head of screw flush with wood. Looks like a decorative brass pin.

HOW TO GLUE JOINTS TO STAY: You need never worry about a joint glued up with Weldwood Plastic Resin Glue. It makes a bond stronger than the wood itself. And it gets stronger as it ages. Always in perfect condition when you want to use it, because you mix it yourself from the powder, in a few seconds. Stain free, rot-proof, highly water resistant, inexpensive. America's largest selling wood glue.

QUICK CLEAN HANDS. A dab of cotton soaked with ordinary finger-nail polish remover works fine to take paint, varnish, etc., off your skin.

PREFER BLONDES? You can get those rich "woodsy" blond or pickled effects by using White Firzite on any wood: hard, soft, ply or solid. Or for pastel tones, tint White Firzite with colors-in-oil. It gives an easy, amazingly beautiful finish!

PAINTER'S SECRET: Just brush Clear Firzite on plywood to prevent "wild" grain. It's also a wonderful undercoater on any paint or enamel jobs.

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Makes a bond stronger than wood itself. Highly water resistant.

FIRZITE®
White for pickled or blond effects. *Clear* tames wild grain on stain jobs.

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Want to Climb a Mountain?

[*Continued from page 256*]

route of the Canadian Pacific. Mt. Eisenhower, a stockade of turrets and blockhouses, was once known as "Castle Mountain." The last part of its 9,030 feet requires soft-soled climbing shoes and resistance to dizziness.

North of Colorado, the immense plateau that supports the Rocky Mountains gradually slants downward. This helps to explain some of the climbing dangers in the Canadian Rockies. The mountains may be less formidable in absolute altitude, but they tower far more impressively above their immediate bases.

For example, the lowest of all North American railroad crossings over the Continental Divide is that of the Canadian National in Yellowhead Pass, where the line girdles Mount Robson. It is only 3,717 feet in elevation. This totals barely more than a third of the elevation of the Denver & Rio Grande Western, on the 10,239-foot hump of Tennessee Pass in Colorado.

Ice Field Feeds Three Oceans

Geographers refer to the Canadian Rockies as the "hydrographic apex" of the continent. At no other place in the world are three major oceans fed from one frozen bosom. This cradle is the Columbia ice field, an immense natural refrigerator covering more than 150 square miles. It nourishes the foaming headwaters of the Columbia River, which flows to the Pacific Ocean. It feeds the sources of the North Saskatchewan, which surges to the Atlantic Ocean via Hudson Bay. And the Athabaska Glacier, a white tongue of the Columbia ice field, spawns the beginnings of the vast Mackenzie River, which meanders 2,500 miles to the Arctic Ocean.

Among the mountains to be climbed this summer by the ski expedition testing cold-weather equipment will be Snow Dome, 11,340 feet in height. This one peak has ice on its vertical flanks that pours into all three of the above river systems. In fact, the party's highest biv-

[*Continued on page 260*]

Brand New! **WAR SURPLUS** Released Since **KOREAN TRUCE**

BRAND NEW!
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CAPACITY

HYDRAULIC CYLINDER

- ALL STEEL CONSTRUCTION
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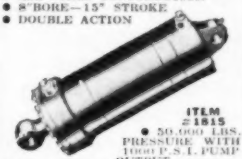

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- 50,000 LBS. PRESSURE WITH 1000 P.S.I. PUMP OUTPUT
- UP TO 70,000 LBS.—CAPACITY ON INTERMITTENT SERVICE.
- SOLID STEEL 2½" PISTON ROD
- 1" PORTS
- OVERALL DIAMETER—10½"
- DISTANCE BETWEEN CENTERS—28¼" CLOSED—43¼" OPEN.

IDEAL FOR:

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HAND FLUID PUMP

WITH STRAINER

ITEM #129—Type D-2—May be used as a boat bailing pump, sump pump, barrel pump, fuel transfer pump, for water, oil, gasoline, insecticides, etc. Bronze and aluminum construction. ¾ in. pipe thread ports. Fine general utility hand pump. Capacity—300 Gal. perhour. Ship. wt. 6 lbs.
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CONTROL VALVE

ITEM #126—Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has ¾" pipe thread inlet and outlet. ½" pipe thread cylinder ports. Newly manufactured to our specification. Ship. wt. 8¼ lbs.

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Will deliver 200 gals. per min. against 65 ft. head using 5.2 H.P. at 3500 R.P.M.

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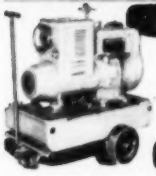

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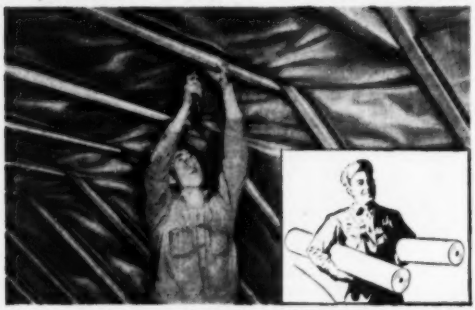

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Want to Climb a Mountain?

[*Continued from page 258*]

ouacs will be on the shifting surface of the Columbia ice field itself.

Because of the crevasses, some of the skiing will be done with the eight members of the expedition roped together. This has required patient practicing in advance. The party is to be led by Norwegian-born Leif Alvaer, who is now a Canadian citizen. He is ranked as a foremost authority on cross-country and mountain skiing. Alvaer's party will consist of seven men and one woman, Peggy Austin, mother of two children and a former Canadian Ladies' Ski Champion.

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In addition to experimenting with clothing and nylon sleeping bags, the expedition will try to subsist on a daily food ration of only two pounds per person. Yet this diet will provide 4,100 calories, far more than the normal intake. Dehydration and compact meal rations will substitute nourishment for weight.

Besides trying several unclimbed peaks, the party will undertake the first ski ascent of 12,294-foot Mt. Columbia, second highest summit in the Canadian Rockies.

Brigadier Sir Oliver Wheeler, who is president of the Alpine Club of Canada, explains that it is difficult to estimate the number of unclimbed mountains in his country because so many noble peaks still are without names. Many of the most spectacular of these lie north of the Canadian National Railways, in what is known as the Lloyd George Range of the Rockies. This saber-toothed wall forms a jagged and mysterious skyline, when viewed from the Alaska Highway.

This summer—and for many summers to come—adventurous men and women will be clinging to its vertical sides, climbing to mountaineering fame. END

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One thing you can learn by watching the clock is that it passes the time by keeping its hands busy.—*L & N Magazine.*

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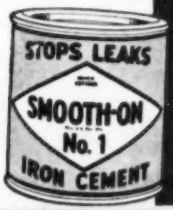

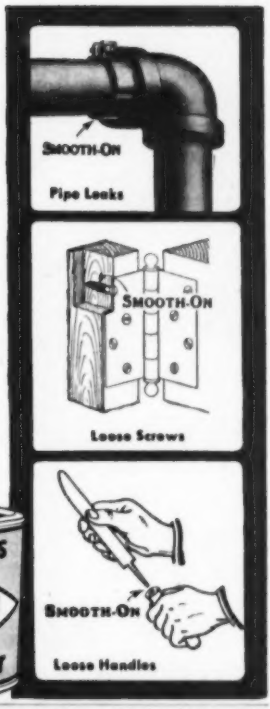

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What Makes the Earth Wobble

[Continued from page 99]

now without allowing for the change, your property would be rotated to the left almost six degrees. In other words, a resurvey of a thousand-foot boundary line that pointed due north 100 years ago would now miss the original line by 105 feet at the end.

The link is found. Geophysicists knew that for 400 years the greater part of the earth's magnetic field had been drifting westward—at the average annual rate of about 12 miles a year at the equator. But they had never had enough information to calculate the rate of drift over short periods. Studying his charts, Vestine found that about 1890 the drift had begun slowing down. By 1910 it had been only a few miles a year. Then it had begun speeding up.

This pattern matched the one found by the astronomers—the earth itself had slowed down between 1890 and 1910, thus making for longer days, and then had begun picking up speed.

In tracing the connection between the drifting magnetic field and the changing length of the day, a number of scientists have come up with approximately the same answer. These include Dr. E. C. Bullard and Dr. S. K. Runcorn of Cambridge University; Dr. W. M. Elsasser of the University of Utah; and Dr. Walter Munk and Dr. Roger Revelle of the University of California.

Magnetism starts way down. The magnetic field at the surface of the earth, these scientists agree, is an extension of one created within the core—presumably by an electric current located about 200 miles from the earth's center and circling around it.

The field drifts at the surface because the outer part of the earth rotates at a slightly different speed from the core. In effect, the core contains an engine that makes it speed up or slow down. Whatever the core does, the outer part does just the opposite—in order to obey the law of conservation of momentum.

The earth rotates from west to east.

[Continued on page 264]

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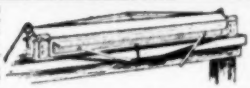

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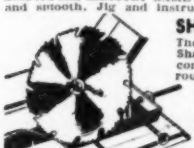

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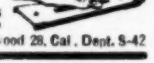

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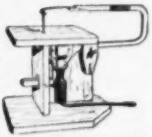

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What Makes the Earth Wobble

[*Continued from page 262*]

When the core goes slower than its mantle, the magnetic field at the surface also goes slower; in other words, it drops behind, or drifts west. As the core puts on speed to close the gap between itself and the outer part, the field drifts less.

The earth is two balls. It may be easier to grasp the idea if you think of the earth as a hollow ball with a much smaller ball inside. They are whirling at different speeds. A number of holes have been punched in the smaller ball, and a light at its center casts a pattern of dots on the inside surface of the big ball. This pattern doesn't stay at the same place because the two balls aren't moving at the same speed.

What could make the core turn at one rate, and us at a different one?

Radioactivity runs this engine. Scientists suppose that there's a heat engine at work, fed by radioactive fuel. Dr. Bullard has calculated that as little as one percent of the radioactive substances found in the surface rocks would be enough for the job. The heat sets up currents in the liquid core, and the irregular currents act sometimes as a drag, sometimes as an accelerator.

Nevertheless, the surface and the core remain pretty well hitched, and the irregular variations in the length of the day tend to cancel out. The answer seems to be that the turbulent core and the rest of the earth are electromagnetically coupled. The lines of force running between the molten metal and the solid outer part exert a braking action.

Rocks can conduct. How, some scientists asked, could sufficiently powerful electric forces pass back and forth to link the core and the outer part? Rocks are poor conductors. But Dr. Harry Hughes, an English physicist now at Harvard, and other researchers have shown that at the high temperatures inside the earth, rocks become good conductors.

What about the earth's wobble? Looking at his charts, Dr. Vestine answers that the westward drift of the magnetic

[*Continued on page 266*]

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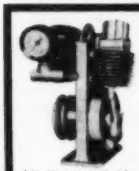

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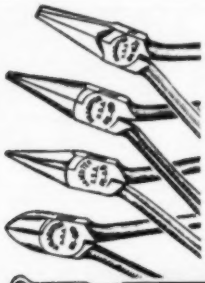

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What Makes the Earth Wobble

[*Continued from page 264*]

field is accompanied by an irregular northward motion of the field, near Indonesia. This points to a similar motion in the liquid core, with a southward motion on the opposite side of the core. The law of conservation of momentum then makes the North Pole shift.

Dynamo or thermocouple? Perhaps you've been wondering where the electric current that's responsible for the earth's magnetic field could come from. The geophysicists, who also have been wondering, now offer two explanations.

The so-called dynamo theory holds that weak magnetic fields occur anywhere in the universe where there is a large body of electrically conducting fluid—as there is in the core.

Given even a weak field, plus the turbulent motions of the core, and electricity is generated as in a dynamo.

The other main theory centers on thermoelectric forces. If you have two wires, and cool one and heat the other, you can generate electricity. Perhaps the molten core acts as one wire, and the cooler mantle of the earth the other.

Why the Pole wanders. Wherever the electric current comes from, its path in the molten, turbulent metal must be full of local eddies and dips. These would account for the variations in direction and strength of the magnetic field, as measured at the surface. They would also help explain why the north magnetic pole doesn't stay put.

But as yet there is no explanation for one puzzling fact. In the last hundred years, the force of the magnetic field, as measured at the earth's surface, has dropped by six percent. At that rate, not very many thousands of years from now, nobody will worry about variations in the magnetic compass: there won't be any magnetic compass. END

Thought for Today

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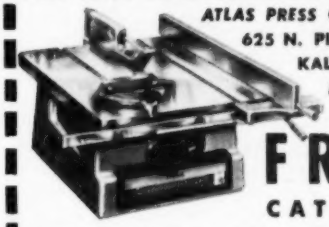

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At leading hardware, lumber, and auto supply dealers.
FREE—*write for handy booklet "How to Spray."*

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Science Speeds Shaving With "Canned Lather"!

That's right! They've invented a gadget that makes shaving faster, easier, more pleasurable! Now you can get rich, creamy lather right out of a can . . . ready to use!

No brush to slow you down . . . no greasy cream to clog your razor. Just push valve . . . out comes lather! That's AERO SHAVE . . . the wonderful new "canned lather" that contains 3 beard-softeners to wilt toughest whiskers in a jiffy . . . *plus soothing lanolin to protect your skin against shaving irritation.*

Get AERO SHAVE Lather Bomb today . . . in the handy metal container with the turret top that won't leak when you travel.

Big Bargain! Aero Shave is the lowest priced "push-button" lather bomb on the market today!

USE "PUSH-BUTTON" LATHER

AERO SHAVE

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FREE BOOKLET

Your Guide to Speedy Accurate LEVELING

Send for your free copy of "ON THE LEVEL," a booklet that tells you how to handle every type of leveling job speedily, easily, accurately and economically with the new, amazing LEVELALL.

Learn how LEVELALL operates on the principle that "water seeks its own level." . . . how you can level points all alone . . . how easy it is to handle and use the transparent plastic tube, shut-off valves and mounting brackets . . . why LEVELALL is better and quicker than a transit . . . how LEVELALL pays for itself quickly by saving time and costs . . . and how satisfied customers praise this precision instrument.

Send for the booklet and get the facts . . . then you'll want a Deluxe LEVELALL . . . only $12.95. Better yet, take advantage of our money-back guarantee and order your LEVELALL now. Dealer inquiries welcome.

L E V E L A L L

LEVELALL, 81-F Webster St., Rockland, Mass.
☐Please send free booklet, "On the Level." ☐Mail me Deluxe LEVELALL @ $12.95 ☐Regular 50' model at $9.95 ☐Ship postpaid full price enclosed. ☐Ship C.O.D.

Name_____

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City_____Zone_____State_____

The Other Fellow's Shop

[*Continued from page 180*]

it and be neutralized before they had time to eat away pistons, cylinder walls and bearings. After trying various methods for putting magnesium in contact with the crankcase oil he came up with a drain plug fitted with a rod of special magnesium-aluminum alloy. After installing one in his own car, he persuaded several fleet owners to try such plugs.

Finally, in 1949, Johns decided to put his magnesium-alloy drain plug on the market. Now its sales are about 12 times as great as those of his dowel maker and lathe tools.

Advice to Home Workshoppers

To other home workshoppers who dream of expanding their own hobbies into profitable businesses, Winthrop Johns offers some practical advice:

- "If you have an idea, test it out thoroughly before you risk any money trying to market it. Be sure there is a need for it and be sure you can make it at a price that will sell and still pay you off.
- "If you do hit on something that has appeal—and a market—don't rush out and expand your equipment and your space. Try to get along with what you have for a while.
- "Don't expect to get rich overnight. Brace yourself to the fact that perhaps for quite a time everything will be going out and very little will be coming in.
- "Above all, if you are married, make doubly sure that your wife is willing to go along with you on the idea or at least is willing to suffer and cooperate."

Although Johns has not invented a new kind of mousetrap, he has devised a new way to use a conventional mouse- or rat-trap. He nails it in a vertical position, bait down, to any wall, door jamb, or other convenient vertical surface about two inches off the floor. He says it works when traps placed on the floor won't, because the mouse or rat can't walk over the trap from the rear end and trip it without getting caught. END

Good Reason

"Why is Mr. Knight pacing up and down on his front porch?"

"He's awfully worried about his wife."

"Is that so? What's she got?"

"The family car."—*Pure Oil News.*

Only HOLD-E-ZEE
The Original AUTOMATIC GRIP
SCREWDRIVERS

PROVIDE THESE FEATURES:
- **LOK-BLOK** that makes blade twist and impact proof.
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- **HAND GROUND BITS**—chrome vanadium, chrome plated blades.

YET COST NO MORE THAN ORDINARY SCREWDRIVERS

At Leading Dealers Everywhere!

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WELD **BRAZE** **SOLDER** **CUT**

4 WAY WELDER
ONLY **$14.75** f.o.b. factory

Complete with Twin Carbon Arc Torch and accessories . . . to handle all metal-craft work.

Acclaimed by thousands of Homeowners, Mechanics and Hobbyists as the welder of 1001 uses. Easily operated from properly wired 110 volt AC or DC line. The ideal gift with a life-long use....Order today on 10 day money back guarantee.

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Dealers or Representatives Needed for nationally advertised line of Spark Plugs — Oil Filters — Auto Specialties — Liberal Proposition — Full or Part Time — Experience Not Necessary — Write Today

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Get real live action with miniature water pump. Only 4 3/4" high — 3 1/4" wide. Threaded for pipe or uses 3/8" rubber tubing. Sturdy rustproof alloy metal — mounted on rubber. 110 A.C. — 60 cycle. 1/250 H.P. Pumps 50 gal. per hr. Complete — ready to work. Immediate money back guarantee. Send check or M.O. Or send C.O.D., you pay postage. Dealers wanted.

$9.95 IN U.S.

MOORE MANUFACTURING CO.
SWEDESBORO 16 NEW JERSEY

CUT COSTS with ALLEN Punch Press

1-Ton Power Bench Type
Powerful, Dependable, Economical

For light work—stamping, forming, riveting, etc.—Metal, fiber or other material.

Overall height 17 1/2" . . . Base size 8 1/2" x 8 1/2" . . . Die bed 5 1/2" x 8 1/2" . . . Ram face 1 1/2" x 3 1/2" . . . Ram stroke 3/4" . . . Positive 3/4" ram adjustment . . . Sturdy, single pin, non-repeat hand lever clutch. V-belt drive. Weight 105 lbs. . . . Requires only 1/4 to 1/2 H.P. Motor.

The machine of a thousand uses! Adequate for many types of work now done on larger presses at greater expense.

$97.50 Less Motor

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Order TODAY. Price $97.50 F.O.B., Clinton, Mo. (Includes Motor bracket, V-belt. Motor pulley, less motor.)

ALVA F. ALLEN Dept. PS CLINTON, MO.

HOW TO STOP VALVE TROUBLES
by DUANE CARTER
International Racing Champion

I race for a living . . . depend on a smooth-running engine for my bread and butter. That's why I use Miracle Power in the gas and oil of my racers—and private car, too. You see, heat in upper cylinder areas, even in passenger cars, often reaches 1400° F.—over twice the temperature at which oil burns off! So you can't count on oil to lubricate valves and lifters. But Miracle Power is not affected by extreme temperatures. It keeps valves free and lubricates when heat breaks oil down. And Miracle Power prevents Dry Starting Damage—cause of most engine wear, because oil can't reach all parts right after starting. But a light, tough film of Miracle Power is *always* there preventing dry metal to metal contact.

An independent laboratory reports Miracle Power means more power, longer engine life and less oil consumption—just what I've found in *my* experience. Get this free report from The AP Parts Corporation, Dept. 812, Toledo, Ohio. And start using Miracle Power in your gas and oil today. It will pay off for you, as for me!

★ ★ ★

Miracle Power, a blend of super lubricants, including colloidal synthetic graphite in suspension, *treats the engine, not the oil.* 85c size for use in gas and oil every 1000 miles and 39c size for top cylinder lubricant between treatments. (Slightly more in Canada.) Money back guarantee at car dealers, garages, gas stations. Approved by Ford, Kaiser and Willys for sale through their dealers.

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Only $39.95

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Standard Model: 60 Cycle, 110-120 volt A.C. Other cycles, voltages available.

(1) Motor guaranteed against burn-out during ownership or replaced free. (2) Removes more material with less upkeep than any other sander at any price. (3) Over 1000 hours of continuous sanding without breakdown in laboratory endurance trial. (4) Work-Light standard equipment—a Syncro "first" for portable sanders of its type. (5) Vibration-absorbing handle floats in rubber (Pat. Pend.). (6) Easy to use, hand operated, positive paper holding clamps. (7) One hand operation—no jumpy, twisty torque to fight. (8) Most powerful reciprocating sander motor (Patented). (9) No oiling—power unit floats in rubber—no cams, bushings, belts or gears to wear out.

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☐ **TRIAL ORDER:** I enclose $39.95. Send postpaid New No. '900' Sander with accessories . . . on 10 Day Money Back Trial Offer.

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Music Warms Mechanical Brain

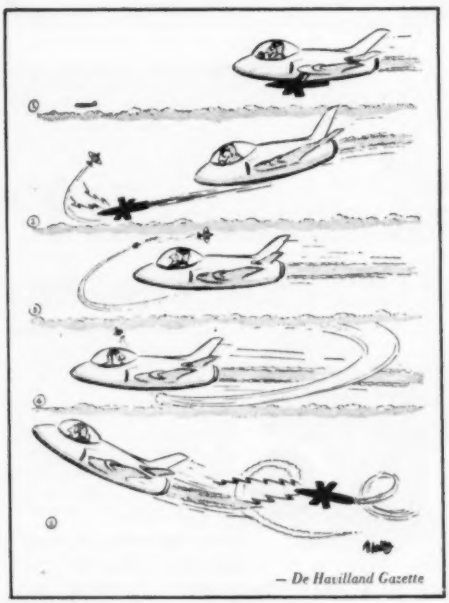
A CONCERT warms up the big electronic computer at the National Bureau of Standards in Washington. Its operators feed it problems that generate the tones for such favorites as "Dixie," "America," and "K-K-K-Katy."

By giving the machine instructions that force it to delay a certain time, say 1/500 second, between each of its computations on a problem, a note that corresponds to 500 cycles per second, or about C above middle C on a piano keyboard, can be forced from the computer.

Different notes can be played by varying the time delay introduced in working out the problems.

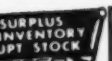
A spare-time contest between two of the machine's masters resulted in the perfection of the musical performances. Frank Stockmal won first musical honors by performing "Dixie," even though he comes from New Haven, Conn. Then he programed "K-K-K-Katy" and, later, rendered "America."

Since the machine has a range of only about two octaves, its possible repertoire is quite limited. Other songs known to have been programed on other computers are "God Save the King" and "Auld Lang Syne."



— *De Havilland Gazette*

GIGANTIC SAVE-TO-70% **MAIL SALE** WAR SURPLUS EXCESS INVENTORY BANKRUPT STOCK



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- Finest piston 100-lb. compressor. 3 c.f.m. Build your own air system. Special..... **$19.95**
- Also tanks, regulators, etc. at big savings. Send for data.

All items in this ad sent PREPAID, except Searchlight!

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- Marvelous 3000-4000-w. 115-v. 60-c plant. Army's finest. 4-cyl. water cooled engine, fully standard. Govt. cost over $800 Spl **$349.50**
- 115/230-v trans..... $19 extra.

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- Leading make guar. multi-jet unit. Sprays 11'. Complete with finest bronze gear pump, hose, barrel mtg., valves, etc. $150 value. Special **$77.95**

Many other buys in weed spray units.

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For farms, estates, orchards.

- Clinton engine-pump on 50-gal. tank with agitator, 50' hose, hand boom, etc. List $225. SPECIAL... **$114.50**

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- Genuine brand new Capacitor start General Electric 3 H.P. 115-volt 60-c single phase farm utility motor. Ideal for saws, elevators, pumps, etc. Guaranteed. List $224.50. SALE **$121.90**

SPECIAL Of The Month!

New DeLuxe Army **TOOL CHEST**

28"x38"x12"

- Wonderful attractive unit. Finest wood cabinet design. Four lift-out drawers, excellent hardware, etc. Heavy and durable.
- Ideal for home shops, contractors, tool rooms, etc. Govt. cost, $59.60. SALE **$21.95**

SUPER CLOSEOUT BARGAINS

- Army Hip Boots (10, 11 or 12).....$7.89
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$50 NIGHTLY RENTING WORLD'S LARGEST LIGHT!

- Make real money nights renting Army 20-mil. beam searchlight to stores, fairs, night ball games, etc.
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New CATALOG! Hundreds of time and money-saving ideas for hobbyists, builders, professional woodworkers! New 28-page catalog describes latest portable electric tools—how they work—what they do—where they save. Explains features and uses of electric saws, belt sanders, orbital sanders, disc grinder-sander-polisher, routers, planes, shapers, drills, bench grinders, chain saws, hedge trimmers—tool accessories. Shows what to look for when buying electric tools—how to get most value. Write today. Send 10c to cover postage and handling. **Send for your copy NOW!**

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Sharpens round shank drills from 3/32" to 1/2" in diameter, up to 6" long. Grinds old drills like new in 4 different point angles, using hand or power grinding wheels. Money-back guarantee, only **$2.95**

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Revolutionary new Mason's Tool saves time and money on any masonry block wall project. Lays absolutely uniform, smooth ribbon of mortar. No guesswork. Every course comes out true and level—eliminates waste of mortar—easy to use by amateurs.

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NEW! Every Electric Drill A Powerful PORTABLE JIG SAW

"ARCO JIG-SAW"

HAS SAME CAPACITY, CUTS AS FAST AS SAWS COSTING $50 & UP!

Does work of Jig, Keyhole, Coping, Band, Rip, Hacksaw.

HAS EXCLUSIVE, BUILT-IN AIR BLOWER.

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Here for the first time is a Portable Jig Saw that attaches in ONE MINUTE to any 1/4" electric drill. It will handle any project from the smallest to the largest, cuts openings without a **starting hole.** Cuts intricate patterns in wood, plastics, metals.

"ARCO JIG SAW" is a powerful tool that is easy to handle because of its **Right Angle Drive, Safety-Yoke & Worm Drive Clamp** make it a vibration-free unit.

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NEW P1 GENERATORS

Electric Auto-Lite, 200 Amps, 24 Volt, 2500 RPM. Dandy arc welder. Wt. 53 lbs. Approx. Govt. Cost $450. NEW. $17.50 incl. easy to follow diagram.

SPECIAL CARBON PILE TYPE VOLTAGE REGULATOR Helps maintain constant current and prevents pulsation. Ideal for installation with above Generator for lighting plant. Wt. 2½ lbs. NEW. Approx. Govt. cost $90. NOW ONLY $4.95 POSTPAID!

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Open and close garage doors, remote control of industrial machines, marine use, displays, etc. Motor drives actuator in a 6½" travel through a reduction gear box. Wealth of gears. 24 Volt, 11 Amps, 1750 lb. lift. Wt. 8½ lbs. Approx. GOVT. COST $250. While they last — $8.95.

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Wonder Drugs Change Farming

THE magic bug killers—penicillin, streptomycin, Terramycin, Aureomycin and others—are famous for the human lives they save. But some scientists think that the wonder drugs will find even more revolutionary uses in farming.

Antibiotics are widely used in animal feeds. About 13 percent of the total 1952 antibiotic production was fed to animals to make them grow bigger faster. Experiments are continuing in many research laboratories to determine exactly why antibiotics stimulate growth.

Drugs Combat Plant Diseases

The use of the wonder drugs to control plant diseases is the latest of the agricultural uses. Halo blight of beans and fire blight of apple and pear trees will be conquered by antibiotic sprays if extensive field tests bear out earlier results.

Fire blight is considered the worst single disease of fruit trees. In some areas it has eliminated pear growing and seriously limited the varieties of apples that may be grown. Research on fire-blight control with antibiotics has been successful in widely separated centers. Dr. Robert Goodman of the University of Missouri, Dr. P. A. Ark of the University of California Experiment Station, and the Ohio Agricultural Experiment Station have reported success in using streptomycin and Terramycin against fire blight in apples. Dr. J. C. Dunegan of the U. S. Department of Agriculture was also successful in controlling fire blight of pear trees in a small-scale field experiment in California. This year Pfizer and Co., a large antibiotic manufacturing firm, will distribute Agrimycin, a commercial mixture of streptomycin and Terramycin, for testing against fire blight on at least 100,000 apple and pear trees.

Affects Bean Plants Systemically

Work with halo blight of beans has centered at the Beltsville, Md., station of the Department of Agriculture. There Drs. John W. Mitchell and William J. Zaumeyer have found that streptomycin spray will control the disease. Among the important results of this research is evidence that streptomycin acts systemically in bean plants. This means the antibiotic gets into the plant's circulation system and is carried to the points of infection. END

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Remove paint fast, easily, safely from houses, woodwork, boats with the **BRAND NEW**

LUDLOW ELECTRIC PAINT REMOVER

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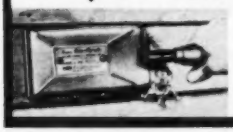

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ANYONE CAN OPERATE IT! **$10.95**

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FULLER'S "SCREW HOLDER"

SCREW DRIVERS

NOW! do the job at HALF THE COST!

- Spring Clip holds and sets screws tightly!
- Reaches those "out of the way" spots!
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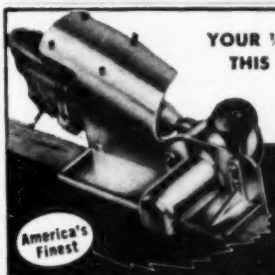

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America's Finest

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POWER PLANER

SAVES TIME AND WORK ON MANY JOBS

IMPROVED DESIGN—nothing like it at near the price. Saves time and work—planes accurately any wood, plywood or hardboard. Use on dozens of jobs—doors, screens, storm windows, cabinet work, etc.

EXCLUSIVE ATTACHING FEATURE—stainless steel clamp strap and four adjustable aligning screws hold planer and drill firmly together. Gives same "feel" as jack plane—many times faster. Change on or off in a jiffy.

Extra tough, heat-treated spiral rotary cutter, 2" wide with adjustable cutting depth from 0" to 1/4". Strong but lightweight die-cast alloy frame. Gears sealed in lubricant. Gears and cutter enclosed for safety. The perfect tool for handyman, amateur builder, home work shop.

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SANDING ATTACHMENT for planer & 2 Sanding Drums $1.00 Extra.

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- Proved performance. Nationally advertised and sold for 7 years. Satisfied customers around the world.

GIL-BILT 10-in. TILT/ARBOR SAW

- 27x28 in. table, 13½ in. capacity in front of blade
- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees
- Floor model 34" high, table always stays level
- New Departure ball bearing arbor, ⅝" precision shaft turned down for ⅝" bore blades, alum. housing, shipped ready to run.
- Jackscrew and 4½ in. dia. handwheel lowers and raises blade
- Cast aluminum miter gauge and self-aligning rip fence guide

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jackscrew mechanism and handwheel, and all other metal parts less blade $22.95
Same Kit with 10" Combination Blade $25.90
Same Kit with 8" Combination Blade $24.90

GIL-BILT 12-INCH BAND SAW

- Cuts to center of 24 inch circle
- Handles stock up to 6 inches thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings; Upper wheel runs on two ⅝" bore Oilite Bronze bearings
- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled
- Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws
- Rigid cast aluminum wheels fully machined ready-to-install. Heavy rubber tires
- Uses standard 28 inch blades up to ¾ in. wide
- Fully enclosed mechanism for utmost safety

GIL-BILT Metal Parts Kit includes Plans, rubber tires, aluminum wheels, 1 in. shaft, ball bearing spindle, tilt mechanism, blade guides, table tilt segments, and all other metal parts $23.95

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Sea Slugs Shipped by Air for Study of Their Colors

LIVE sea slugs—"flowers of the sea"—are being flown to the Smithsonian Institution in Washington so that scientists can make complete descriptions of the tiny animals' brilliant coloring. The colors fade rapidly when the animal is preserved in alcohol, and as a result few people have ever seen the full beauty of the sea slug.

Dr. Harold J. Humm of the University of Florida ships specimens of the slugs, which are technically known as nudibranchs, to the Smithsonian by air in specially designed bottles of sea water to keep them alive for several days. The Smithsonian has one of the world's largest collections of nudibranchs.

Emperor of Japan Studies Them

An enthusiastic private collector is the Emperor of Japan, whose articles on slugs have been illustrated by leading Japanese artists. In addition to their colors, nudibranchs develop extensions of the skin and digestive tract that look like delicately modeled, tiny plants.

Nudibranchs live chiefly on small sea anemones found on the sea bottom. Most sea anemones are equipped with stinging organs—microscopic balls filled with virulent poison. As soon as a stinger ball is exposed to any tension it explodes, releasing the poison.

They Borrow Anemones' Poison

Sea slugs have the strange ability to eat these poison balls without exploding them. In some way, the balls pass through the digestive tract and into some of the appendages growing out of the digestive organs to the outside of the slug's body. There they are retained and serve the sea snail in the same way they served the sea anemone.

In earlier stages of their evolution, nudibranchs were shelled, like most land and water snails. Embryonic forms still have rudiments of shells which have been discarded by the race, presumably because they served no purpose.

Matchbox Striker Cleans Spark Plugs

THE striker panel torn from a penny matchbox makes a good abrasive for cleaning up the electrodes of oil-fouled spark plugs.

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PRICE F.O.B. K. C. MO.

CONVERTS TO ARC WELDER 200-250 AMP. OR LIGHT PLANT CAP. LOAD 5000 WATTS

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New Amplidyne MOTOR GENERATOR. Use as 24/32 D.C. motor, pulls ½ HP. Applicable for 110 V. A.C. by simple change in connection. Applicable to independent and rural lighting. Instructions incl. Wt. 30 lbs. Cost over $140.00 $7.50

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INSECTICIDE PUMP SPRAYER FIRE EXTINGUISHER. Four gallon size includes approx. 5 ft. of high pressure hose with fine mist nozzle. Used, good condition built to give years of heavy duty service. Wt. 15 lbs. Price..... $2.95 ea., add postage.

CUNO OIL FILTER Aircraft type. Filters oil without cartridge replacements. Just turn handle and cartridge is clean. Standard ⅜" inlet and outlet ports. STOP CHANGING OIL. Instructions included ..... $4.95 post paid

GEAR HEAD MOTOR. Heavy Duty ⅛ H.P. 24V. D.C. 800 R.P.M. Series Wound, reversible motor, to drive a reduction gear unit giving a 14:1 ratio. The gear shift runs 600 R.P.M. Unit is applicable for 110V. A.C. Instructions incl. Stock #921..... $5.50

DELCO MOTOR 6 Volt DC. Shaft is ¼" in dia., 1¼" long. Size 5"x3" two mounting studs. 1200-2000 RPM. Price $3.50 post paid

MAKES IDEAL WINCH HOIST AIRCRAFT STARTING MOTOR operates on 12 to 32 Volts. Gives high torque, slow speed and tremendous power. Applicable for pulling or moving heavy loads. Makes ideal winch or heavy duty hoist. For belt or direct drive. Mfg. by Jack & Heintz. O. Cost over $300.00. Ship. wt. 35 lbs. Stock #J10..... $9.95 f.o.b. KCMo.

SELF PRIMING ELECTRIC BLACK & DECKER MOTOR & PUMP UNIT. Ideal for oil burners, Aquarium fluid metering, coolant pressure lubricating, etc. Pump rated 2 G.P.H. Motor rated 1/30HP 1200 R.P.M. For 24 to 32V DC & applicable for 110V AC. Dimensions 7¾"x3¼"x3¼" Data incl. $50.00 value..... $9.95

ELECTRIC ACTUATOR Has a ⅛ H.P. 24V. D.C. 7500 R.P.M. reversible motor with push & pull actuator. Motor drives actuator in a 5" travel through a high reduction gear box. Ideal for remote control, lifting, lowering, etc. Complete with micro switches. Stationary load rating is 2800 lbs. & applicable for 110V. A.C. Stock #AA-LM. Instructions incl. $9.95

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Stock No. 512 Double action hydraulic cylinder **2¼" Bore, 4" Stroke, ¾" Dia. shaft including built in Hydraulic control valve.** $75.00 value. Wt. 9 lbs..... $8.95 f.o.b. KCMO.

Stock #11 Double action 1½" bore, 6" stroke, ⅜" Dia. shaft. Clevis mountings. 1100 lbs. with 1000 P.S.I. ..... $8.95 post paid

Stock # 12 Double action 4" Bore, 10¾" Stroke, 1-5/16" dia. shaft. Rated 12560 lbs. with 1000 P.S.I. Clevis mounting. O. Gov't. cost over $300.00 $27.50

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No. 21 FOUR WAY HYDRAULIC VALVE Off at neutral with built in relief valve for limit of cylinder strokes. Control with 3 positions, raise, lower and hold. ½" pipe ports. #617..... $9.95 post paid

PESCO EQUALIZER VALVE No. 397-D. New For 2 cylinders or 2 systems, will prevent uneven movement due to unbalanced load. Data incl. #75.00 value $9.95 post paid

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ACCUMULATOR Rated 2000 P.S.I. Approx. 1 Gallon Capacity 6" dia. 11" length ½" tube ports (4/4"-16 thread) New..... $12.95

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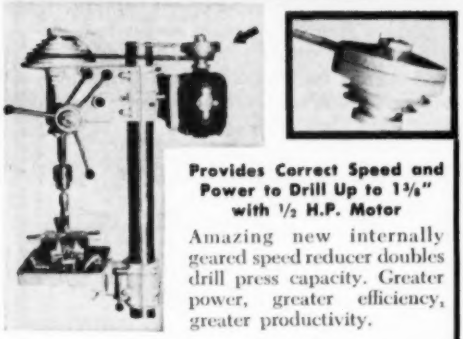
New "PULL-GEAR" SPEED-REDUCING PULLEY



Provides Correct Speed and Power to Drill Up to 1⅜" with ½ H.P. Motor

Amazing new internally geared speed reducer doubles drill press capacity. Greater power, greater efficiency, greater productivity.

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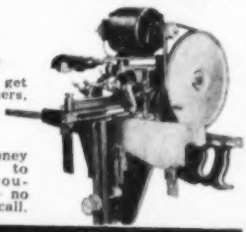
It explains how you can get business from home owners, farmers, carpenters schools, factories, etc. "I get work from 20 and 30 miles away"—says Charles H. Smith. Free Book, "Money Making Facts," tells how to start. Send coupon today — no salesman will call.



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MEET WILSON'S NEW INTERESTING KITS FOR 1954

Wilson's aim is to provide motor devices to the scientifically minded boy and hobbyist—dependable dry-cell motors and parts for applying them to models, experiments and use by industry. *Fully Guaranteed.*

Model 88—Pulley Kit holding in convenient plastic case set of 3 pulleys, 1 to 3-step, sizes 1/4" to 3/4", for 3/32" shafts. Complete with set screws and 2 pulley belts. **Price $2.00.**

Model 3113—"Build it yourself" parts kit for "Tiny Atom" motor. Plastic case also contains shafts, brackets, connectors, worm gear, pulley, screws and educational instruction book. **Price $3.00.**

Model 700—Wilson's Super Power Kit—contains "Tiny Atom" motor, variable speed power applicator, gears, pinions, pulleys, friction drive, connectors, shafts, brackets, belts. Leaves nothing more to buy. In plastic case. **Price $10.00.**

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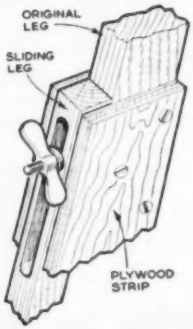
Graduated Compass-Point Bar

ATTACH a few feet of a dime-store, steel-tape rule to the wood strip you use with your trammel points, and you can set them to draw big arcs or circles exact size the first time. Holes for escutcheon pins can be punched in the tape or ground with a pointed stone in a hand grinder. Score the center of the clamp on each point with a triangular file for lining it up with the graduations.—*W. G. Waggoner, Sacramento, Calif.*

Foil Labels Foil Weather

A PERMANENT label for garden planting can be typed on aluminum- or tin-foil, and it won't wash off no matter how hard it rains. To make a sharp impression on the foil, lift the typewriter ribbon out of the way. The typed names can be cut off in strips and wrapped around the marking stakes.—*Robert Marie, Ft. Wayne, Ind.*

Slotted Leg Adjusts Table



To SET up my picnic table evenly on rough ground I made one leg shorter than the others and then put strips of plywood along two edges of the leg, forming a groove. Then I cut a piece of wood with a slot in it to fit the groove. A wing bolt goes through the slot and a hole drilled in the leg, fastening the movable part to the original one at any point desired.—*Elmer Le Fevre, Rochester, N.Y.*

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PAL SWIM FINS
New, first grade. Of top quality flexible rubber with treaded bottom and adjustable heel strap. Will float and are fully vented for speed and protection. Vented for air and drainage. Sizes: Small, Med., Large **2.99** PER PAIR

DIVING MASKS
Ideal for shallow water skin diving or swimming. Made of gum rubber with sturdy glass lens and adjustable head band.

SMALL **99¢** MED. **1.49** LARGE **1.98**

Diving Masks and Fins shown herein are only a small part of our complete line send for FREE folder on others.

DIVING MASK WITH 2 BUILT-IN SNORKLE TUBES
Has full face mask, covering mouth and nose. Two built-in snorkle breathing tubes **10.95**

COMBINATION MASK AND HOOD
Protects hair, eyes and ears. For ocean or fresh water swimming and diving. Made of the finest live rubber. Comes with an edge sealed safety glass face plate. **12.50**

'SQUALE' GOGGLES
Used for swimming and diving by Navy Frog Men. **3.50**

NEW UNDERWATER FLASHLIGHT
Case is hard rubber. Absolutely water tight and pressure resistant. Gives sharp bright beam. . . **2.95**

GOV'T SURPLUS FLOATING LAMP
Originally A.A.F emergency ditching equipment. A useful underwater flashlight or floating marker. Comes with 12 ft. of waterproof cord, for tying to object above or below the water. Rights itself, light side up. With battery and extra bulb. Surplus priced at . **1.49**

B-7 GOGGLE KIT
Has special, soft spong rubber frame. Lenses are shatter resistant – consist of 1 clear and 1 green polarized lens. Ideal for cyclist, racer, etc. **1.99**

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SCIENTIFICALLY IMPROVED
SPORT DIVER
Never before has a diving unit of such quality construction and extra features been offered at this low price. Tested and approved by: E.R.Cross, U.S. Master Diver for 14 years. The Sport Diver is a completely equipped unit. Has a high pressure air flask, tank valve, pressure reducing regulator, breathing tube, demand regulator, mouthpiece and harness. Recommended for use in depths up to 30 ft. The special (1800 PSI) air tank can be refilled by most dealers of welding and cutting gasses. Completely tested and ready to use. ALL NEW! A $115.00 Bargain Value for ONLY **79.95**

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NOW you can build your own diving lung. Our special folder of instructions completely describes how it's done. Kit includes Air Bottles, Pressure Regulator, Hoses, Safety Belt (B-14), Shoulder Harness, Clamps, Mouth Piece, Valves, etc.

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Cartridge pockets allow for better balancing of ballast weights. **89¢**

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Shatterproof. Designed to stand pressure of 1800 PSI. Tested and approved. Ready to use. . . . . .
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Palley SPECIAL / Gives up to 1 hour underwater at average depth. Has 15 lb.. capacity – 48 cu. ft. Size: 6½" diam. x 23½". **17.95**

NEW CO2 HARPOON GUN
Has JET POWER – One of the simplest, most effective underwater guns you can find anywhere. Designed for one-arm use. Weighs only 27 ounces. Has 13 ft. of 150 lb. test NYLON line on a snag proof reel. Positive safety catch. All-metal body. Rust resistant finish. Uses CO^2 charges for power. . . . . A $29.95 value for ONLY **13.95**

CO^2 CHARGES – Box of 10 new charges for above gun . . . **79¢**

SNORKLE TUBES
All plastic. Rubber mouthpiece. Permits breathing with face submerged. Ball valve seals tube when unit is immersed.
SNORKLE without Valve **1.95**

NEW WADING SUITS
Back in Stock AGAIN! Makes surf and deep stream fishing a pleasure. Ideal for use whenever it is necessary to protect the body or clothes from muck, silt, moisture, etc. Made to top Gov't specifications of rubberized canvas. Has vulcanized seams & built-in rubber gloves and boots. . . . **10.95**

SAVE $8.00 ON NEW HY-SCORE .177CAL. AIR RIFLE
WAS $18.95 **10.95**
Take advantage of our CUT PRICE PURCHASE! SAVE! Made in Belgium for the famous Hy-Score Company. Has an ALL-STEEL, fully rifled barrel, 17" long. Requires no pumping, just cock and fire. Shoots .177 caliber pellets or darts. Stock is a beautiful, natural finish hardwood. Makes an ideal training rifle for youngsters – also excellent for indoor or outdoor targets. Weight 5 lbs.

AQUA MITTS
Finest live rubber. Web fingers. For swimming or diving. **1.95** PAIR

GOV'T SURPLUS MAE WEST LIFE VEST
A pneumatic life saver. Used by fishermen, swimmers, boatmen, etc. Will safely support up to 250 lbs. Can be inflated by mouth or with CO^2 cartridges (listed beneath Harpoon Gun below).
USED **2.95** NEW **4.95**

AIR CORPS RUBBER BOATS USAF SURPLUS
Made to government specifications. An ideal boat for Fishing or Hunting in river, lake or ocean. Safe, lightweight, easy to pack. Reconditioned and ready to use.
1 MAN **22.95** 5 MAN **59.95**
7 MAN **69.95** 10 MAN **110.00**
HAND AIR PUMP **3.95**

CORNELIUS AIR COMPRESSOR
A 3 stage, 1500 PSI Air Compressor. Has built-in 1/3 HP, 27 volt, 20 Amp DC motor. Compressor delivers .4 CFM. Has a built-in safety valve. Adapt for filling diving air tanks, laboratory use, etc. ONLY **32.50**

GOV'T SURPLUS **AIR HOSE**
Connects to air supply and mouthpiece.
23 inches long **44¢** 42½ inches long **75¢**

ARMY FIELD PHONES
A private phone or intercom system. Easy to operate. Ideal for use on farms, target range, mountains or forest or any place portable two – way communication is desired. Gives clear reception up to 2 miles. Uses two standard batteries. Set contains ringing generator, leather carrying case and one phone. Several of these phones may be used on one line.
Price per each phone **14.95**
Price for a system of two sets **29.95**

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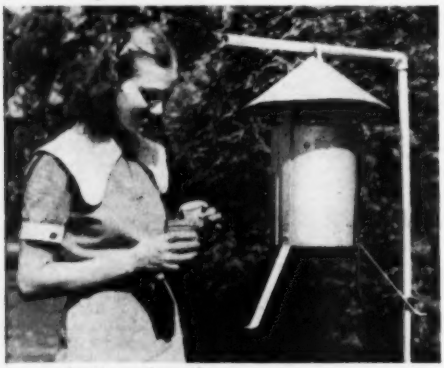
How Much Did You Learn?

By Stanford E. Taylor and Helen Frackenpohl
Washington Square Reading Center, New York

Now you can sample how much you remember of the useful and interesting information packed into this issue of POPULAR SCIENCE MONTHLY. Answers to the questions are printed just below the quiz. After each answer is a page reference to the article on which the question was based.

1. The earth's wobble is thought by scientists to be due to
a. variations in the size of its surface
b. changing magnetic strength in its core
c. currents created in its liquid center

2. This girl is



a. fueling a lawn lamp
b. tending a mosquito trap
c. measuring dew

3. Trailer life has changed. Three-quarters of all trailers are now
a. bought by vacationers
b. thirty feet or longer
c. moved only by special trucks

4. One big drawback to buying very powerful binoculars is
a. unsteady viewing
b. difficult focusing
c. a duller image

5. The hose for your diving outfit won't snag readily on underwater objects because
a. the diver is careful to keep it taut
b. the pump man keeps check on it
c. it floats, stays safely on the surface

6. Millions of tons of rock will be blasted from the river bed above Niagara Falls to
a. increase hydroelectric-power output
b. enhance the beauty of the falls
c. provide a firm base for a new bridge

7. The Baker Electric had a fast get-away, and a top speed of
a. 15 m.p.h.
b. 20 m.p.h
c. 30 m.p.h.

8. The slow and seemingly safe tractor caused an amazing number of deaths in 1950:
a. 450
b. 640
c. 970

9. The Canadian Rockies are tough on mountaineers because of
a. almost vertical faces
b. remote locations
c. strong winds

10. Safety engineers on Oklahoma's new Turner Turnpike have set a minimum speed of
a. 40 m.p.h.
b. 45 m.p.h
c. 50 m.p.h.

Answers: 1. c—p. 96; 2. b—p. 108; 3. b—p. 116; 4. a—p. 203; 5. c—p. 163; 6. b—p. 144; 7. b—p. 138; 8. b—p. 133; 9. a—p. 90; 10. a—p. 128.

NEXT MONTH . . .

Popular Science's Annual How-to-Do-It Index

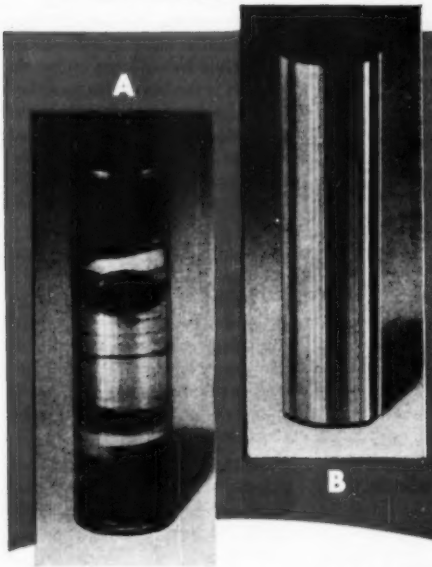
Want to build a wall . . . model a clipper ship . . . grow a tree . . . paint a house . . . retop a convertible? An index of how-to-do-it articles on those subjects and hundreds more in PSM during the past 12 months will be included in the July issue.

Texaco Tips

on car care

How to help keep your brake system in safe condition

Your car's hydraulic brake system is your No. 1 safety guard while driving. To keep it in good operating condition, see your nearby Texaco Dealer for inspections. He will check brake lines, making certain there are no leaks. He will check the fluid level in the master cylinder. If necessary, he will add fluid. Your Texaco Dealer's know-how helps make your driving safer —and more enjoyable.



How to wear-proof your engine

Nature's best motor oil couldn't keep up with today's high-compression engines. So Texaco engineers developed a motor oil that actually *wear-proofs* your engine for the life of your car — *Advanced Custom-Made Havoline*. With its Balanced-Additive formula, Havoline keeps your engine clean, free from harmful sludge, rust and acids. Notice the difference between these two piston pins after a tough 21 hours of stop-and-go tests. Pin "A" shows rust deposits even with a good heavy duty motor oil. But pin "B" remained clean and rust-free—proof that today's best motor oil is *made* . . . not born. Drive in for *Advanced Custom-Made Havoline* today! See your Texaco Dealer . . . *the best friend your car has ever had.*

THE TEXAS COMPANY

TEXACO DEALERS

in all 48 states

Texaco Products are also distributed in Canada and in Latin America

The Truth about Super-Batteries

Are international cartels trying to suppress them?
Will they really re-charge themselves?
What about silver, etc., plates?
How good are long-life guarantees?

by Frank E. Williams

WHAT CAN YOU BELIEVE—and what can't you believe—about claims being made for batteries today? Since I'm the man who started all the excitement by producing the Life-time battery, you might as well get the facts—once and for all—straight from me.

First, let's discuss what seems to be the most popular claim made by the half-dozen or so companies that have sprung up in the last few months:

"Secret European (type) *battery now available here!"* To begin with, all batteries are European "type," dating back to Volta's original discovery in 1801. As for modern European batteries, we tested the best of them—a German job—and it skinned everything in sight except the Life-time battery (we won that test by such a narrow margin we'd rather not talk about it), but there wasn't anything secret about the way the German battery was made: just good workmanship.

What about silver, etc., plates? Our search for the ideal plate material went back through the original discoveries of Volta—included investigation of Ritter's gold-ammonia battery and Gautherot's fantastically expensive platinum plate design over 150 years ago. True, these were Europeans, but the alloy we ultimately selected and named the "neutronic" plate is a product of American metallurgy that Europeans probably will never be able to duplicate.

Are international cartels trying to suppress a super-battery? Frankly, the only opposition to the Life-time battery has been hard, defensive selling from U.S. manufacturers who—understandably—don't want to spend millions in costly re-tooling to produce an entirely new kind of battery. *International cartels?* Bunk! Anyone in this country who complains about any kind of "suppression" hasn't got a battery worth suppressing—they're just crying to get attention.

Can any battery really re-charge itself? Yes. Any good battery will recuperate if you give it a few minutes' rest after running it down. The difference is: how fast will it bounce back? and how many times? In a test by Motor Trend magazine, the Life-time battery set a record by bouncing back to life 23 times, and still had more power than the two famous brands it was tested against.

How good are long-life guarantees? Right now, some companies are advertising fantastically long guarantees in order to sell batteries—but they haven't got either the product or the finances to back them up, and a lot of people may be disappointed in a year or so if their batteries go dead and the company that sold them has gone out of business. Your safest bet is to buy only from a reputable dealer.

Then what about the 6-year guarantee on the Life-time battery? A fair question. Even though one of the prototype Life-time batteries is still going strong after 11 years, we set a 6-year limit on our guarantee—a figure so conservative that a multi-million-dollar bonding company has added its backing to our own.

Check the price, the guarantee, and the company before you buy! We sincerely believe that the Life-time battery, with a legitimate six-year bonded guarantee, is the only really outstanding value on the market today. One price for all cars and standard trucks: $29.95 for six-volt sizes, $34.95 for 12-volt sizes (plus a complete line of marine and industrial batteries). If your dealer doesn't have the Life-time battery yet, (10,000 dealers do), show him this page and ask him to order one for you—or write us for the name of your nearest Life-time battery dealer.

the LIFE-TIME Battery

An American

Success Story

When California inventor Frank Williams turned his attention from professional engineering and invested his personal fortune in the development of the Life-time battery, he started a chain reaction that has brought vastly increased incomes to 10,000 dealers and distributors in the U.S. and abroad. Batteries are now rolling out of four plants to meet tremendous consumer demand, and with over $1,000,000 slated for "the most ambitious battery advertising campaign of the decade," the company expects to double present sales within eight months. For information about dealerships and distributorships now being awarded, write:

CONTINENTAL MANUFACTURING CORPORATION

Dept. PS-6
Washington Blvd.
& Motor Ave., Culver City, Calif.

BUY DIRECT-FROM-FACTORY at LESS THAN WHOLESALE

HI-LINE 6000 WATT PLANT

(Item 162) **Push Button Start** 115-230 v. 60 cyc. A.C. A brute of a power plant with a rugged 14 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995. **With self-starter.** Factory price **$645.00**

Same plant, but **with crank start.** **$585.50**

Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. Item 163. Factory price **$345.00**

PORTO-POWER 1500-1700 WATT PLANT

(Item 20) 115/130 v. 60 cyc. AC. Push button start. Powered by a 5.10 HP Briggs engine. This plant combines the compactness and easy portability of the smaller plants, but has a high output to handle heavier starting loads. Built-in winding for charging 12 v. batteries. An ideal standby power plant for operating lights, sump pumps, oil burners and communication systems. Perfect for contractors and line crews. Item 20. Wt. 146 lbs.

Factory Special Price..... **$279.50**

GIANT 2000-2500 WATT PLANT

(Item 31) 110-120 v. 60 cyc. AC. absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or 6 HP Wisconsin engine—complete with all accessories: engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty.

(Item 31) Wt. 210 lb.

Reg. price $585. Special at..... **$299.50**

Same plant with electric self starter (Item 31a)..... **$359.50**

Generator only and control box.... **$169.50**

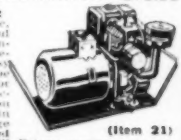
DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.

Variable Speed Selector

(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: 1/2-1 hp. 30 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs.; Reg. list $228, $252 and $152. Our prices **$79.50, $89.50 and $114.50**

MASTER MECHANIC



(Item 21)

MASTER-LITE 2500 Watt Plant 110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by tape or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories, includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00 **$329.50**

(Item 21). Factory Price

3000-3500 WATT PLANT Item 198: 110-220 v. 60 cyc. AC Belt Drive, Wis. engine **Push Button Start.** Wt. 370 lbs. Heavy duty **$399.50**

GENERATOR ONLY for belt drive.. $239.50

52 pc. SOCKET SET

Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in 1/2" drive, 3/8" drive and 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all unused, guaranteed against breakage. A beautiful set of tools that will handle any job; in a big doghouse steel box. Wt. 17 lbs. (Item 205)

List price $62.90. Factory special... **$27.95**

44 Pc. SOCKET SET

(Item 596) Same unconditionally guaranteed, non-breakable sockets as above. Complete range of 21 sockets from 1/4" thru 7/16" (1/4" drive) & 7/16" thru 1-1/16" (1/2" drive). Two extensions, reversible 1/2" ratchet, 3 drift punches, sliding "T" head, all angle coupling, 1/2" speeder, 1/4" breakover, 5 pc. high chrome alloy combination wrench set and 8 pc. offset wrench set in big doghouse tool box with ample room for other tools.

Reg. $49.50. Wt. 16 lb..... **$21.95**

PORTABLE LIGHT PLANTS

Ideal for your camp, cottage, trailer or boat!

(Item 24)

600-700 WATTS PUSH BUTTON START 115 v. 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense and Fire Dept. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275 value **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine **$199.50**

LITTLE GIANT—350 WATT (Item 273) 115 v. DC. 1/4 hp. Briggs engine. Perfect for lights, radios, small power tools. Wt. 65 lbs. Factory price..... **$99.75**

We make fully automatic controls to operate any of the above light plants. Write for details. We make all sizes up to 25,000 Watts.

EXTENSION CORD

(Item 16a) Heavy duty, made of Buna rubber insulated #14-2 conductor, stranded wire encased in a treated braid jacket. **So tough that you can drive over it.** Use indoors or out. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet.

(Item 16) 40 ft. 2½ lbs..... **$1.99**

Combination 2-40 ft. and 1-20 ft. total 100 ft. ..... (Item 16c) **$4.95**

NEOPRENE CABLE #14-2 (Item 185) Heavy duty, very flexible, 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. *A terrific buy at only* **$8.95**

NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. **$6.95.** 100 ft. (Item 200)..... **$12.95**

MASTER GARDENER

SELF-PROPELLED

It's a lawn mower
It's a power sickle
It's a cultivator
It's a rotary tiller
It's a bulldozer
It's a snow blower

NO PUSHING

Tractor shown with 30" Rotary Mower Attachment

(Item 206)

Where else can you get a power tool that does so many jobs? Works for you year 'round. Does terrific job of cutting grass or weeds. Or prepares mellowed, deep seed beds without labor. Built-in power take-off to drive pumps, saws, etc. Safety clutch—can't burn out. New gear tread tires assure non-slip drive. The Master Gardener performs better—does more than tractors costing twice as much. Converts in minutes to Tiller. Power Sickle, etc. Basic tractor with Briggs and Stratton engine. Only **$119.50**

Rotary Lawn Mower **$42.50**
Sickle Bar Mower **$42.50**
Lawn Mower Hitch **$4.50**
Furrowing Tool **$8.75** Rotary Tiller **$42.50**
Cultivator ... **$8.75** Disc Harrow **$15.75**
Snow Blow ... **$38.50** Plow **$15.00**

Freight prepaid. Easy payment plan available.

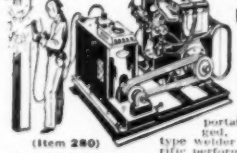
MASTER AIR COMPRESSOR

Tank Tested up to 500 lbs. per sq. in.

COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing & the hundreds of other jobs done by compressed air. Piston type, 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure up to 150 lbs.; and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed **SAFE.** Low factory prices. With 1½ HP., 110 v. AC motor.

Reg. $175. (Item 209)..... **$109.50**

POWER MASTER DC ARC WELDERS



(Item 280)

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes are easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and **triple** V-belt or flat pulley. You can pay more, but you can't buy a better welder.

WELDER ONLY—DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 110 lbs. $450 value **$119.50**

WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) Wt. 110 lbs. $400 value. Special **$99.75**

COMPLETE POWER MASTER (Illustrated above) powered by a 14 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200. Factory price..... **$449.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder..... **$10.50**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

8" Fan, wt. 5 lb..... **$6.85**
9" Fan, wt. 6 lb..... **$7.85**
10" Fan, wt. 7 lb..... **$8.85**
12" Fan, wt. 8 lb..... **$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E)..... **$11.95**

12" Fan, wt. 10 lbs. (Item 10f)..... **$12.95**

AIR COMPRESSOR ACCESSORIES

Pressure Gauge, range 0-160 lbs. 1/4" pipe thread connection, 2" face..... **$1.50**

Check Valve, solid bronze, 200 lbs. pressure, works in all positions. 1/4" or 3/8" pipe threads, ... **$3.35**

Pressure Regulator, solid brass, std. 1/4" pipe thread, reduces any pressure to a range of 0-50 ..... **$3.75**

Pop (safety) Valve, adjustable from 0-200 lbs. 1/4" pipe thread **$1.40**

SPECIAL . . . All four above..... $8.95

Pressure Switch for pumps and compressors, 0-85 lbs., **$5.95;** 0-150 lbs. with unloader (3 HP), **$10.95;** 0-200 lbs. (5 HP), **$12.95**

CONDITION-AIRE EXHAUST FANS

Save big money installing your own exhaust fan. Efficient propeller type blades moves huge volume of air quietly and effortlessly. Heavy welded frame—predrilled for easy installation. Just cut opening and bolt in place. **Continuous duty** motors. Ideal for attics, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.

Blade Opening		CFM	Wt.	Item	
16"	18¼"	2625	19 lb.	365a	**$27.95**
18"	19¼"	3600	27 lb.	365b	**$31.95**
20"	21¼"	4100	30 lb.	365c	**$39.95**

SHUTTERS—open automatically, 16", wt. 10 lb. **$9.00;** 18", wt. 12 lb., **$10.25;** 20" Wt. 14 lb., **$11.25.**

THERMOSTATS: BAHN type (range 40°-60°), Wt. 2 lb. **$6.95.** ATTIC type (50°-90°) Wt. 2 lb..... **$11.95**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10¢ for... BIG 1954 Catalog

MASTER MECHANIC MFG. CO. DEPT. 18M **Burlington, Wis.**

"Yessir! the Ol' Redhead has changed to CAMELS"

(choice of many of his friends in the Major Leagues!)

RED BARBER, *Famous Sports Announcer*

BOB LEMON, Cleveland Indian pitcher, says, "Camels are mild — the flavor's great!"

MICKEY MANTLE, Yankee slugger, tried Camels for 30 days. "I'm for Camels!"

HARVEY KUENN, Detroit Tigers' flashy shortstop, says: "I go for Camels' flavor!"

MEL PARNELL, Red Sox pitcher, is a long-time Camel fan. "I'll never change!"

RED SCHOENDIENST, Cards' second baseman, says, "I'll take Camels' mildness!"

TED KLUSZEWSKI, Cincinnati Reds' slugging infielder, says: "Camels are richer!"

WARREN SPAHN, Braves' hurler says, "I'm for Camels' cool mildness!"

GRANNY HAMNER, Philadelphia Phils, says Camels have the "best flavor"!

EDDIE LOPAT, Yankee hurler, has smoked Camels for years. "Can't beat 'em!"

MICKEY VERNON, Senators' 1st sacker, says, "Camels' flavor agrees with me!"

for Mildness... for Flavor...

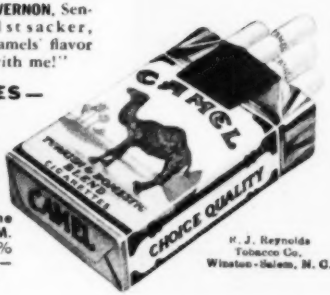
Camels agree with more people than any other cigarette!

CAMELS FIRST IN SALES — NOW LEAD BY RECORD

50 8/10 %

Latest published figures* from the leading industry analyst, Harry M. Wootten, show Camels now 50 8/10% ahead of the second-place brand — biggest preference lead in history!

*Printers' Ink, 1954



R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

● Year after year, Camels increase their popularity-lead over the second-place brand! Listen to Major Leaguers — listen to smokers everywhere—and you'll know why more people get more pure pleasure from Camels' mild, flavorful blend of costly tobaccos! Try Camels for 30 days — and *see!*